Vol. 9, No. 2
January 31, 1984

# Energy Research Abstracts

Abstracts 1757-4277

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

# CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P. O. Box 62, Oak Ridge, TN 37831. Telephone (615) 576-1303; FTS 626-1303.

## PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

***Energy Abstracts for Policy Analysis (EAPA)***

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following programmatic efforts; legislative, regulatory, and other legal aspects, social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $6.00, foreign $7.50 per copy; annual cumulative index, domestic $10.00, foreign $12.50 per copy. The annual subscription price is $70.00 for domestic subscribers and $87.50 for foreign subscribers.

***Energy Research Abstracts (ERA)***

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $165.00 for domestic subscribers and $206.25 for foreign subscribers. A single issue costs $9.50 (domestic) or $11.90 (foreign).

***DOE Patents Available for Licensing (PAL)***

DOE is prepared to grant exclusive or nonexclusive, revocable licenses under DOE-owned U. S. patents and patent applications; this semiannual publication provides abstracting and indexing coverage of this literature. *PAL* is available on subscription as PB84-946800 from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $14.00 for domestic subscribers and $28.00 for subscribers outside the North American continent; prices for single issues are $7.00 and $14.00, respectively.

The following monthly update journals are available to the public on subscription from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161; use the identifying order number (PB- No.) when subscribing. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $75.00 for domestic (North America) and $150.00 for foreign (outside North America) subscribers. A single issue is $7.00 (domestic) and $14.00 (foreign).

***Current Energy Patents (CEP)*–PB84-902800**

Provides coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization.

***Energy and the Environment (EAE)*–PB84-914900**

Devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment.

***Fossil Energy Update (FEU)*–PB84-914600**

Devoted to information on the exploration, development, processing, and use of fossil fuels.

***Fusion Energy Update (CFU)*–PB84-915300**

Devoted to information on controlled thermonuclear fusion, including plasma and fuel research and power plant engineering and conceptual design studies.

***Solar Energy Update (SEU)*–PB84-914500**

Devoted to information on the utilization of solar energy, including biomass and tidal and wind power.

The following semimonthly bulletins are also available from the National Technical Information Service (NTIS). The annual subscription rate for one volume (calendar) year (24 issues; no indexes) is $40.00 for domestic subscribers and $80.00 for subscribers outside the North American continent; use the identifying order number (PB- No.) when subscribing. Back issues are available for $5.00 each.

***Acid Precipitation (APC)*–PB84-901000**

Covers all aspects of acid precipitation, including effects and possible control measures.

***Coal-Based Synfuels (CBS)*–PB84-901400**

Covers all aspects of conversion of coal into gaseous or liquid fuels.

***Coal Preparation and Pollution Control (CPC)*–PB84-900800**

Covers all aspects of coal preparation and cleaning and reducing pollution from its direct combustion.

***Direct Energy Conversion (DEC)*–PB84-946600**

Covers the following areas: photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells.

***Geothermal Energy Technology (GET)*–PB84-914700**

Devoted to information on the exploration, development, and utilization of geothermal resources.

***Laser Research (LAR)*–PB84-901100**

Covers all aspects of laser research and development, but excludes applications.

***Nuclear Fuel Cycle (NFC)*–PB84-913400**

Covers all aspects of the nuclear fuel cycle, both front end and back end.

***Nuclear Reactor Safety (NRS)*–PB84-913500**

Covers the following safety aspects: accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures.

***Radioactive Waste Management (RWM)*–PB84-902900**

Covers the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers.

***Solar Thermal Energy Technology (STT)*–PB84-901200**

Covers research in materials, concentrators/receivers, salinity gradients, etc., for development of efficient and reliable solar thermal conversion systems.

***Unconventional Petroleum (UCP)*–PB84-901300**

Covers all aspects of secondary and tertiary recovery of petroleum and of oil shales and tar sands.

## INTERNATIONAL ENERGY PUBLICATIONS

The Technical Information Center cooperates with the following organizations in the publication of international abstract journals: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts;* and (3) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts.* In each case, the cognizant foreign agency provides the non-U.S. information to TIC for inclusion in the Energy Data Base; in turn, TIC provides the U.S. information for input into the respective journal.

***Atomindex***

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

***Biomass Abstracts***

A bimonthly abstract journal with comprehensive coverage of information in any step involved in the eventual conversion of biomass to energy. *Biomass Abstracts* is available free to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 42 IR pounds per year. Make checks payable to the Institute.

***Coal Abstracts***

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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# ENERGY RESEARCH ABSTRACTS

## ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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## ABOUT *ENERGY RESEARCH ABSTRACTS*

*Energy Research Abstracts (ERA)* provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

*ERA* is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

*ERA* is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37831.

*ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $165.00 for domestic subscribers and $206.25 for foreign subscribers. A single issue costs $9.50 (domestic) or $11.90 (foreign). The cumulative indexes will be available in printed form from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, and in microfiche form from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161, and from Engineered Systems, P. O. Box 866, Oak Ridge, Tennessee 37831.

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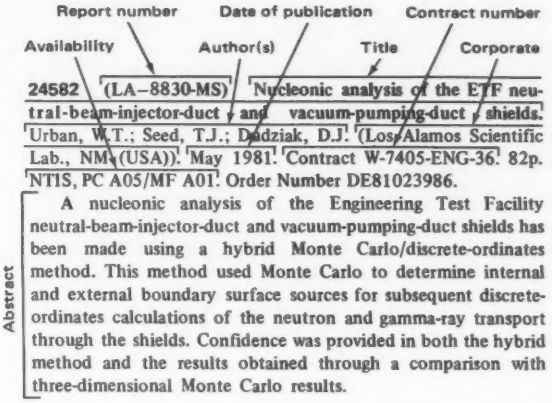
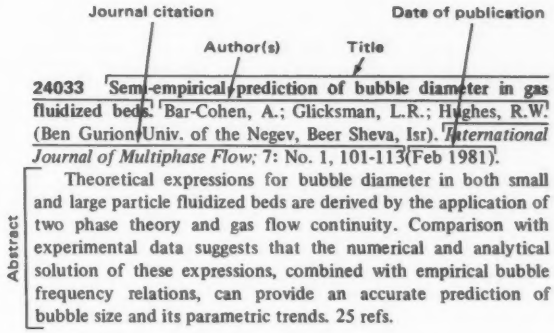
# HOW TO USE *ENERGY RESEARCH ABSTRACTS*

## ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Contract number
Availability
Author(s)
Title
Corporate
24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.
Abstract
A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.


Journal citation
Date of publication
Author(s)
Title
24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr.). International Journal of Multiphase Flow; 7: No. 1, 101-113 (Feb 1981).
Abstract
Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

## INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

### • Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

**Los Alamos Scientific Lab., NM (USA)**
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (R:US)

### • Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

**Bar-Cohen, A.,** Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033 (J:US)
**Dudziak, D.J.,** *See* Urban, W.T., 6:24582
**Glicksman, L.R.,** *See* Bar-Cohen, A., 7:24033
**Hughes, R.W.,** *See* Bar-Cohen, A., 7:24033
**Seed, T.J.,** *See* Urban, W.T., 6:24582
**Urban, W.T.,** Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (R:US)

### • Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

**TOKAMAK ETF**
**Neutral Atom Beam Injection**
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (R:US)
**Neutron Transport**
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (R:US)

### • Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

| | | |
|---|---|---|
| **W-7405-ENG-36** | **Los Alamos National Lab., NM (USA)** | |
| | 6:24582 | LA–8830-MS |

### • Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number–Report Number Correlation is included for convenience.

| | | |
|---|---|---|
| **LA–** | | |
| **8830-MS** | 6:24582 | NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d |

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Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts*, Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37831.

# SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 293 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R5 from NTIS for $9.50.

**01 COAL AND COAL PRODUCTS**
- 04 Processing
- 05 By-Products
- 06 Properties
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves and Exploration
- 20 Mining
- 30 Transport and Handling
- 40 Combustion
- 50 Marketing and Economics
- 60 Health and Safety
- 70 Regulations

**02 PETROLEUM**
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Marketing and Economics
- 08 Waste Management
- 09 Environmental Aspects
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Storage
- 50 Combustion

**03 NATURAL GAS**
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Marketing and Economics
- 07 Waste Management
- 08 Environmental Effects
- 09 Artificial Stimulation, Plowshare, etc.
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Combustion
- 50 Storage

**04 OIL SHALES AND TAR SANDS**
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Direct Uses and By-Products
- 07 Health and Safety
- 08 Marketing and Economics
- 09 Waste Research and Management
- 10 Environmental Aspects
- 20 Regulations

**05 NUCLEAR FUELS**
- 01 Reserves
- 02 Exploration
- 03 Mining
- 04 Feed Processing
- 05 Enrichment
- 06 By-Products
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 10 Marketing and Economics
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Regulations

**06 FUSION FUELS**
- 01 Sources
- 02 Processing
- 04 Transport and Storage
- 05 Health and Safety
- 06 Regulations and Policy
- 07 Waste Management
- 08 Properties
- 09 Environmental Aspects

**07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY**
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies

**08 HYDROGEN**
- 01 Production
- 02 Storage
- 03 Transport
- 04 Marketing and Economics
- 05 Safety
- 06 Industrial and Commercial Use
- 07 By-Products
- 08 Properties
- 09 Environmental Aspects

**09 OTHER SYNTHETIC AND NATURAL FUELS**
- 01 Hydrocarbon Fuels
- 02 Alcohol Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 04 Solid Waste Fuels
- 05 Liquid Waste Fuels
- 06 Gaseous Waste Fuels

**13 HYDRO ENERGY**
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Regulations and Licensing
- 05 Economics and Management
- 06 Environmental Aspects
- 07 Power Conversion Systems

**14 SOLAR ENERGY**
- 01 Resources and Availability
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Plants
- 07 Solar Thermal Power Plants
- 08 Ocean Thermal Gradient Power Plants
- 09 Solar Radiation Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage

**15 GEOTHERMAL ENERGY**
- 01 Resource Status and Assessment
- 02 Geology, Hydrology, and Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legal and Institutional Aspects

**15 GEOTHERMAL ENERGY (CONT.)**
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 07 By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory

**16 TIDAL AND WAVE POWER**
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 07 Tidal Power Plants
- 08 Wave Energy Converters

**17 WIND ENERGY**
- 01 Availability (Climatology)
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 06 Wind Energy Engineering

**20 ELECTRIC POWER ENGINEERING**
- 01 Power Plants and Power Generation
- 02 Environmental Aspects
- 03 Power Transmission and Distribution

**21 NUCLEAR POWER PLANTS**
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 05 Power Reactors, Breeding
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 07 Regulation and Licensing
- 08 Economics
- 09 Process Heat Reactors

**22 NUCLEAR REACTOR TECHNOLOGY**
- 01 Theory and Calculation
- 02 Components and Accessories
- 03 Fuel Elements
- 04 Control Systems
- 05 Environmental Aspects
- 06 Research, Test, and Experimental Reactors
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety

**25 ENERGY STORAGE**
- 01 Magnetic
- 02 Compressed Gas
- 03 Pumped Hydro
- 04 Capacitor Banks
- 05 Flywheels
- 06 Thermal
- 07 Liquefied Gas
- 08 Chemical
- 09 Batteries

**29 ENERGY PLANNING AND POLICY**
- 01 Energy Analysis and Modeling
- 02 Economics and Sociology
- 03 Environment, Health, and Safety
- 04 Natural Resources
- 05 Research, Development, Demonstration, and Commercialization
- 06 Nuclear Energy
- 07 Transport and Storage
- 08 Waste Heat Utilization
- 10 Conservation
- 20 Supply, Demand, and Forecasting
- 30 Policy, Legislation, and Regulation
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 60 Electric Power
- 80 Consumption and Utilization
- 90 Unconventional Sources and Power Generation

**30 ENERGY CONVERSION**
- 01 MHD Generators
- 02 EHD Generators
- 03 Thermoelectric Generators
- 04 Thermionic Converters
- 05 Fuel Cells
- 08 Electromechanical Converters

**32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION**
- 01 Buildings
- 02 Transportation
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 09 Education and Public Relations

**33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS**
- 01 Internal Combustion Engines
- 02 External Combustion Engines
- 03 Electric-Powered Systems
- 04 Hybrid Systems
- 05 Flywheel Propulsion
- 06 Vehicle Design Factors
- 07 Emission Control
- 08 Alternative Fuels

**36 MATERIALS**
- 01 Metals and Alloys
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 04 Polymers and Plastics
- 06 Other Materials

**40 CHEMISTRY**
- 01 Analytical and Separations Chemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 04 Electrochemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry
- 08 Combustion Chemistry

**42 ENGINEERING**
- 01 General Engineering
- 02 Facilities and Equipment
- 03 Lasers
- 04 Heat Transfer and Fluid Flow
- 05 Materials Testing

**42 ENGINEERING (CONT.)**
- 06 Safety Engineering
- 07 Vacuum Engineering
- 08 Electronic Circuits and Devices
- 09 Waste Processing Plants and Equipment
- 10 Combustion Systems
- 20 Underground Engineering
- 30 Marine Engineering
- 40 Pollution Control Equipment
- 50 Power Cycles

**43 PARTICLE ACCELERATORS**
- 01 Design, Development, and Operation
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 03 Auxiliaries and Components
- 04 Storage Rings

**44 INSTRUMENTATION**
- 01 Radiation Instrumentation
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 03 Miscellaneous Instruments
- 04 Well Logging Instrumentation

**45 EXPLOSIONS AND EXPLOSIVES**
- 01 Chemical
- 02 Nuclear
- 03 Explosion Detection

**50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

**51 ENVIRONMENTAL SCIENCES, TERRESTRIAL**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

**52 ENVIRONMENTAL SCIENCES, AQUATIC**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

**53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES**
- 01 Social and Economic Studies
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements

**55 BIOMEDICAL SCIENCES, BASIC STUDIES**
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 05 Metabolism
- 06 Medicine
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health
- 30 Agriculture and Food Technology

**56 BIOMEDICAL SCIENCES, APPLIED STUDIES**
- 01 Radiation Effects
- 02 Thermal Effects
- 03 Chemicals Metabolism and Toxicity
- 04 Other Environmental Pollutant Effects

**57 HEALTH AND SAFETY**

**58 GEOSCIENCES**
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 04 Geochemistry
- 05 Oceanography

**64 PHYSICS I**
- 01 Astrophysics and Cosmology
- 02 Atmospheric Physics
- 03 Atomic, Molecular, and Chemical Physics
- 04 Fluid Physics
- 50 High Energy Physics

**65 PHYSICS II**
- 10 Nuclear Physics
- 40 Radiation and Shielding Physics
- 50 Medical Physics
- 60 Solid State Physics
- 70 Theoretical Physics
- 80 Mathematical Physics
- 90 Communication, Education, History, and Philosophy

**70 FUSION ENERGY**
- 01 Plasma Research
- 02 Fusion Power Plant Technology

**99 GENERAL AND MISCELLANEOUS**
- 01 Management
- 02 Mathematics and Computers
- 03 Information Handling
- 04 Law
- 05 Civilian Defense

**CORPORATE AUTHOR INDEX**

**PERSONAL AUTHOR INDEX**

**SUBJECT INDEX**

**CONTRACT NUMBER INDEX**

**REPORT NUMBER INDEX**

**ORDER NUMBER CORRELATION**

# SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 293 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R5 from NTIS for $9.50.

**33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS**
- 08 Alternative Fuels
- 03 Electric-Powered Systems
- 07 Emission Control
- 02 External Combustion Engines
- 05 Flywheel Propulsion
- 04 Hybrid Systems
- 01 Internal Combustion Engines
- 06 Vehicle Design Factors

**56 BIOMEDICAL SCIENCES, APPLIED STUDIES**
- 03 Chemicals Metabolism and Toxicity
- 04 Other Environmental Pollutant Effects
- 01 Radiation Effects
- 02 Thermal Effects

**55 BIOMEDICAL SCIENCES, BASIC STUDIES**
- 30 Agriculture and Food Technology
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 06 Medicine
- 05 Metabolism
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health

**40 CHEMISTRY**
- 01 Analytical and Separations Chemistry
- 08 Combustion Chemistry
- 04 Electrochemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry

**01 COAL AND COAL PRODUCTS**
- 05 By-Products
- 40 Combustion
- 09 Environmental Aspects
- 60 Health and Safety
- 50 Marketing and Economics
- 20 Mining
- 04 Processing
- 06 Properties
- 70 Regulations
- 10 Reserves and Exploration
- 30 Transport and Handling
- 08 Waste Management

**20 ELECTRIC POWER ENGINEERING**
- 02 Environmental Aspects
- 01 Power Plants and Power Generation
- 03 Power Transmission and Distribution

**32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION**
- 01 Buildings
- 09 Education and Public Relations
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 02 Transportation

**30 ENERGY CONVERSION**
- 02 EHD Generators
- 08 Electromechanical Converters
- 05 Fuel Cells
- 01 MHD Generators
- 04 Thermionic Converters
- 03 Thermoelectric Generators

**29 ENERGY PLANNING AND POLICY**
- 10 Conservation
- 80 Consumption and Utilization
- 02 Economics and Sociology
- 60 Electric Power
- 01 Energy Analysis and Modeling
- 03 Environment, Health, and Safety
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 04 Natural Resources
- 06 Nuclear Energy
- 30 Policy, Legislation, and Regulation
- 05 Research, Development, Demonstration, and Commercialization
- 20 Supply, Demand, and Forecasting
- 07 Transport and Storage
- 90 Unconventional Sources and Power Generation
- 08 Waste Heat Utilization

**25 ENERGY STORAGE**
- 09 Batteries
- 04 Capacitor Banks
- 08 Chemical
- 02 Compressed Gas
- 05 Flywheels
- 07 Liquefied Gas
- 01 Magnetic
- 03 Pumped Hydro
- 06 Thermal

**42 ENGINEERING**
- 10 Combustion Systems
- 08 Electronic Circuits and Devices
- 02 Facilities and Equipment
- 01 General Engineering
- 04 Heat Transfer and Fluid Flow
- 03 Lasers
- 30 Marine Engineering
- 05 Materials Testing
- 40 Pollution Control Equipment
- 50 Power Cycles
- 06 Safety Engineering
- 20 Underground Engineering
- 07 Vacuum Engineering
- 09 Waste Processing Plants and Equipment

**52 ENVIRONMENTAL SCIENCES, AQUATIC**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

**50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

**51 ENVIRONMENTAL SCIENCES, TERRESTRIAL**
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

**53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES**
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements
- 01 Social and Economic Studies

**45 EXPLOSIONS AND EXPLOSIVES**
- 01 Chemical
- 03 Explosion Detection
- 02 Nuclear

**70 FUSION ENERGY**
- 02 Fusion Power Plant Technology
- 01 Plasma Research

**06 FUSION FUELS**
- 09 Environmental Aspects
- 05 Health and Safety
- 02 Processing
- 08 Properties
- 06 Regulations and Policy
- 01 Sources
- 04 Transport and Storage
- 07 Waste Management

**99 GENERAL AND MISCELLANEOUS**
- 05 Civilian Defense
- 03 Information Handling
- 04 Law
- 01 Management
- 02 Mathematics and Computers

**58 GEOSCIENCES**
- 04 Geochemistry
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 05 Oceanography

**15 GEOTHERMAL ENERGY**
- 07 By-Products
- 10 Direct Energy Utilization
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 02 Geology, Hydrology, and Geothermal Systems
- 20 Geothermal Data and Theory
- 09 Geothermal Engineering
- 03 Geothermal Exploration and Exploration Technology
- 08 Geothermal Power Plants
- 04 Legal and Institutional Aspects
- 01 Resource Status and Assessment

**57 HEALTH AND SAFETY**

**13 HYDRO ENERGY**
- 05 Economics and Management
- 06 Environmental Aspects
- 03 Plant Design and Operation
- 07 Power Conversion Systems
- 04 Regulations and Licensing
- 01 Resources and Availability
- 02 Site Geology and Meteorology

**08 HYDROGEN**
- 07 By-Products
- 09 Environmental Aspects
- 06 Industrial and Commercial Use
- 04 Marketing and Economics
- 01 Production
- 08 Properties
- 05 Safety
- 02 Storage
- 03 Transport

**44 INSTRUMENTATION**
- 03 Miscellaneous Instruments
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 01 Radiation Instrumentation
- 04 Well Logging Instrumentation

**07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY**
- 03 Isotopic Power Supplies
- 01 Physical Isotope Separation
- 02 Radiation Sources

**36 MATERIALS**
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 01 Metals and Alloys
- 06 Other Materials
- 04 Polymers and Plastics

**03 NATURAL GAS**
- 09 Artificial Stimulation, Plowshare, etc.
- 40 Combustion
- 03 Drilling, Production, and Processing
- 08 Environmental Effects
- 02 Geology and Exploration
- 05 Health and Safety
- 06 Marketing and Economics
- 10 Policy, Legislation, and Regulation
- 04 Products and By-Products
- 30 Properties
- 01 Reserves
- 50 Storage
- 20 Transport, Pipelines, and Handling
- 07 Waste Management

**05 NUCLEAR FUELS**
- 06 By-Products
- 05 Enrichment
- 30 Environmental Aspects
- 02 Exploration
- 04 Feed Processing
- 07 Fuels Production and Properties
- 40 Health and Safety
- 10 Marketing and Economics
- 03 Mining
- 50 Regulations
- 01 Reserves
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 20 Waste Management

**21 NUCLEAR POWER PLANTS**
- 08 Economics
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 05 Power Reactors, Breeding
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 09 Process Heat Reactors
- 07 Regulation and Licensing

**22 NUCLEAR REACTOR TECHNOLOGY**
- 02 Components and Accessories
- 04 Control Systems
- 05 Environmental Aspects
- 03 Fuel Elements
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety
- 06 Research, Test, and Experimental Reactors
- 01 Theory and Calculation

**04 OIL SHALES AND TAR SANDS**
- 06 Direct Uses and By-Products
- 03 Drilling, Fracturing, and Mining
- 10 Environmental Aspects
- 07 Health and Safety
- 08 Marketing and Economics
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 20 Regulations
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 09 Waste Research and Management

**09 OTHER SYNTHETIC AND NATURAL FUELS**
- 02 Alcohol Fuels
- 06 Gaseous Waste Fuels
- 01 Hydrocarbon Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 05 Liquid Waste Fuels
- 04 Solid Waste Fuels

**43 PARTICLE ACCELERATORS**
- 03 Auxiliaries and Components
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 01 Design, Development, and Operation
- 04 Storage Rings

**02 PETROLEUM**
- 50 Combustion
- 03 Drilling and Production
- 09 Environmental Aspects
- 02 Geology and Exploration
- 06 Health and Safety
- 07 Marketing and Economics
- 10 Policy, Legislation, and Regulation
- 04 Processing
- 05 Products and By-Products
- 30 Properties
- 01 Reserves
- 40 Storage
- 20 Transport, Pipelines, and Handling
- 08 Waste Management

**64 PHYSICS I**
- 01 Astrophysics and Cosmology
- 02 Atmospheric Physics
- 03 Atomic, Molecular, and Chemical Physics
- 04 Fluid Physics
- 50 High Energy Physics

**65 PHYSICS II**
- 90 Communication, Education, History, and Philosophy
- 80 Mathematical Physics
- 50 Medical Physics
- 10 Nuclear Physics
- 40 Radiation and Shielding Physics
- 60 Solid State Physics
- 70 Theoretical Physics

**14 SOLAR ENERGY**
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 20 Heat Storage
- 08 Ocean Thermal Gradient Power Plants
- 06 Photovoltaic Power Plants
- 01 Resources and Availability
- 10 Solar Collectors and Concentrators
- 05 Solar Energy Conversion
- 09 Solar Radiation Utilization
- 07 Solar Thermal Power Plants

**16 TIDAL AND WAVE POWER**
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 07 Tidal Power Plants
- 08 Wave Energy Converters

**17 WIND ENERGY**
- 01 Availability (Climatology)
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 06 Wind Energy Engineering

**CORPORATE AUTHOR INDEX**

**PERSONAL AUTHOR INDEX**

**SUBJECT INDEX**

**CONTRACT NUMBER INDEX**

**REPORT NUMBER INDEX**

**ORDER NUMBER CORRELATION**

# ENERGY RESEARCH ABSTRACTS

## 01 COAL AND COAL PRODUCTS

### 0104 Processing

*REFER ALSO TO CITATION(S) 1782, 1784, 1785, 1785, 1786, 1787, 1798, 2076, 2078, 2187*

1757 **(CONF-831199—1-PT.1) Experimental simulation and advanced control aspects of the IGCC concept. Part I. Simulation results.** Corman, J.C. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center). 1983. Contract AC21-80ET14928. 26p. NTIS, PC A03/MF A01. Order Number DE84001527.

From 3. Electric Power Research Institute annual contractors' conference on coal gasification; Palo Alto, CA, USA (2 Nov 1983).

In order for coal conversion systems to be successfully integrated into utility or industrial use, it must be demonstrated that these systems can meet environmental requirements and also produce a fuel that meets the specifications of the downstream equipment. A coal conversion power generation system consists of a chemical plant connected as a fuel supply system to a power generation system. It is critical that these significantly different unit processes be able to function together and perform to the load demands of a utility grid. In many cases the individual components of this integrated coal conversion power plant concept have been operated at pilot scale or full scale for various applications; however, the fuel and power generation systems have never been operated together in a load configuration similar to those anticipated for utility applications. The technical results of the project reported here demonstrate that a coal conversion system and a power generation system can be made to operate together under the constraints imposed by end-use and environmental considerations. 18 figures.

1758 **(DOE/CR/10004—1) Parametric cost analysis for advanced energy concepts.** (General Research Corp., Santa Barbara, CA (USA)). Oct 1983. Contract AC01-79CR10004. 87p. NTIS, PC A05/MF A01. Order Number DE84002339.

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This report presents results of an exploratory study to develop parametric cost estimating relationships for advanced fossil-fuel energy systems. The first of two tasks was to develop a standard Cost Chart of Accounts to serve as a basic organizing framework for energy systems cost analysis. The second task included development of selected parametric cost estimating relationships (CERs) for individual elements (or subsystems) of a fossil fuel plant, nominally for the Solvent-Refined Coal (SRC) process. Parametric CERs are presented for the following elements: coal preparation, coal slurry preparation, dissolver (reactor); gasification; oxygen production; acid gas/$CO_2$ removal; shift conversion; cryogenic hydrogen recovery; and sulfur removal. While the nominal focus of the study was on the SRC process, each of these elements is found in other fossil fuel processes. Thus, the results of this effort have broader potential application. However, it should also be noted that the CERs presented in this report are based upon a limited data base. Thus, they are applicable over a limited range of values (of the independent variables) and for a limited set of specific technologies (e.g., the gasifier CER is for the multi-train, Koppers-Totzek process). Additional work is required to extend the range of these CERs. 16 figures, 13 tables.

1759 **(DOE/ET/10143—13) H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant.** Qualls, G.E. (Ashland Synthetic Fuels, Inc., KY (USA)). Apr 1982. Contract AC05-76ET10143. 40p. NTIS MF A01. Order Number DE83012487.

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The H-COAL Pilot Plant, located at Catlettsburg, Kentucky, began its operations in the spring of 1980. The plant was designed and constructed based on the H-COAL Process developed by Hydrocarbon Research, Inc. The primary purpose of this Pilot Plant was to test the process and prove its commercial feasibility. Equipment and piping at the plant is available commercially and can easily be scaled up to meet the requirements of a commercial plant. Because of the inherent nature of the coal liquids produced by the process, some equipment problems were anticipated. One such problem area was with block valves, particularly in the high pressure letdown area. Tight shut-off requirements are necessary to provide isolation for removal and maintenance of the letdown valves. Double block valves were provided to insure safe removal and replacement of letdown valves. Problems with these block valves did occur at plant start-up, even before the addition of coal. During hot oil circulation, stem leakage was excessive and valve leak-through prevented isolation of letdown valves. A concerted effort was made to eliminate these problems. Additional efforts were made to locate and obtain alternate block valves for this service. This block valve program in conjunction with a similar letdown valve program has extended the length of run times considerably.

1760 **(DOE/ET/10143—19-Rev.) H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev.** Gray, J.H. (Ashland Synthetic Fuels, Inc., KY (USA)). Aug 1983. Contract AC05-76ET10143. 154p. NTIS, PC A08/MF A01. Order Number DE84002450.

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During the design phase of the H-Coal Pilot Plant the instrumentation evaluation for the high pressure vessels indicated the need for nuclear gauges. Therefore, thirty-eight nuclear gauges were installed on 18 vessels at the plant. Their uses ranged from empty/full switches to determining the density of a flowing hydrocarbon stream. Installation and use of nuclear gauges requires a Radioactive Material License granted by Kentucky Department for Human Resources Radiation Control Branch. The processing time from application to license issuance was 13 months. The Radiation Safety Program involved preparing Vessel Energy procedures, marking vessels, writing a Nuclear Safety Manual, and holding training sessions for plant employees. In addition to training personnel in the use of the nuclear gauges, monitoring of the instruments was required. Monitoring was accomplished by wipe testing, surveys and exposure badges. All monitoring results clearly demonstrated the safety of the nuclear gauges. ASFI made any needed repairs and elected on a few installations to add a small amount of shielding to lower the radiation field intensity. These cases were only minor and never involved any risk to plant personnel. The experience at the H-Coal Plant with nuclear gauges has shown them to be safe and sound instruments. Monitoring was performed more often than required, and it can be done less frequently at similar installations. The Radiation Safety Program with its signs, documents, procedures and training sessions was quite successful. Many of the Program's features are applicable in any plant with nuclear gauges.

1761 **(DOE/ET/10143—42) Materials evaluation at the H-Coal Pilot Plant.** Ragle, H.V. (Ashland Synthetic Fuels, Inc., KY (USA)). Aug 1983. Contract AC05-76ET10143. 352p. NTIS, PC A16/MF A01. Order Number DE84002588.

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The H-Coal Pilot Plant near Catlettsburg, Kentucky, was built and operated in order to collect data to facilitate establishment of the design criteria for a commercial coal liquefaction plant. In addition to process data, a great quantity of data pertaining to the materials of construction was gathered during the course of operations both through planned data gathering programs and through activities that were created of necessity. The information in this report is a presentation of materials evaluation data for all general process areas with special emphasis on the Fractionation Area. The process corrosion data were obtained through exposure and evaluation of 55 corrosion test racks composed of a variety of alloys totaling 55 in number that were exposed during four different periods to coal derived hydrocarbons produced from four different types of coal. Weld monitoring and erosion monitoring of process piping is discussed as well as specific areas of interest such as plunger coatings and refractory. The materials development from the beginning of operations to the end of the procect is summarized for both high pressure slurry block valves and high pressure letdown valves. Failure analysis was used on occasion to determine cause of failure or as a means of extracting information from various data sources. Summaries of fifteen failure analyses are presented.

1762 **(DOE/PC/30209—T5) Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981.** Williams, D.C.; Guin, J.A.; Curtis, C.W.; Tarrer, A.R. (Auburn Univ., AL (USA). Coal Conversion Lab.). 1981. Contract FG22-80PC30209. 46p. NTIS, PC A03/MF A01. Order Number DE84002401.

Solvent properties are very important factors in the liquefaction process. The solvent serves a three-fold purpose. It acts as a solvent for indan. The compound 1,4-DHN appears to be significantly more active than the 1,2 isomer in the presence of coal. The order of decreasing reactivity for the model H-donor species is THQ $\approx$ 1,4-DHN $\approx$ 9,10-DHA $>$ 9,10-DHP $>$ 1,2-DHN $\approx$ THA/sub c/ $>$ IND. Table 7 presents the data for conversion of coal to cresol/THF solubles in the presence of several model donor species. The order of reactivity corresponds approximately to that of Table 6. The g of H transferred per g of maf coal (total), when multiplied by 100, gives the amount of H transferred on a wt % of maf coal feed basis, and varies from a low of 0.049 for indan to a high of 0.661 for 9,10-DHA. The amount of coal conversion is seen to correlate fairly well with the amount of H transferred as a percent of maf coal feed. Some significant conclusions are outlined; for a blank reaction without coal, the decreasing order of reactivity of hydroaromatics is 1,4-DHN $>$ 9,10-DHA $>$ 1,2-DHN $>$ IND $>$ 9,10-DHP = TET $>$ THQ $>$ THA/sub c/ $>$ OHA; the decreasing reactivity of hydroaromatics in the presence of coal is THQ $>$ 1,4-DHN $>$ 9,10-DHA $>$ 9,10-DHP $>$ 1,2-DHN $>$ THA/sub c/ $>$ TET $>$ IND; with respect to coal conversion, the order of decreasing effectiveness of the hydroaromatics tested is 9,10-DHA $>$ THQ $>$ 1,4-DHN $>$ 1,2-DHN $>$ 9,10-DHP $>$ THA/sub c/ $>$ OHA $>$ TET $>$ IND; and the amount of coal liquefaction is directly proportional to the amount of hydrogen transferred for several different hydroaromatic species.

1763 **(DOE/PC/40781—T8) Catalytic coal liquefaction. Quarterly report, July-September 1983.** Weller, S.W. (State Univ. of New York, Buffalo (USA)). 1983. Contract FG22-81PC40781. 21p. (FE—2013-25). NTIS, PC A02/MF A01. Order Number DE84001764.

High surface area (40 $m^2/g$), unsupported MoS/sub y/(y$>$2) has been prepared by flash decomposition of ammonium thiomolybdate in flowing helium. This has been used for several purposes: (a) Demonstration of the large effect of pretreatment on oxygen chemisorption; (b) temperature programmed reduction in $H_2$, from 20°C to 500°C, which shows that sulfur species of different stability are present; (c) temperature programmed surface reduction, in which $H_2$ chemisorbed at 20°C is removed as $H_2S$ on programmed heating in He; (d) reduction, followed by exposure to $H_2S$ at 20°C and temperature programmed desorption of $H_2S$; and (e) activity for dehydrogenation of cyclohexane. The study is leading both to a rational methodology for carrying out oxygen chemisorption on supported catalysts, and also to some basic understanding of the nature of the active sites on molybdenum sulfide.

1764 **(DOE/PC/40782—T5) Desulfurization with transition metal catalysts.** Eisch, J.J. (State Univ. of New York, Binghamton (USA). Dept. of Chemistry). 1 Jun 1983. Contract FG22-81PC40782. 5p. NTIS, PC A02/MF A01. Order Number DE83013607.

The principal objective of this research is to uncover new reagents and catalysts for upgrading coal-derived fuels by removing undesirable organosulfur, organonitrogen and, if feasible, oxygen components. During the sixth quarter of this two-year grant the following studies were continued: (a) evaluation of the combined desulfurizing action on SRC liquids of nickel salts and metal hydrides, especially when the reactants are deposited on or attached to inorganic or organic supports; (b) assessment of the efficacy of the solid support in enhancing the desulfurizing action of the subvalent nickel; (c) devising an effective and safe way of maintaining desulfurization columns of such solid supports at 40 to 100°C for extended periods; and (d) carrying out exploratory work on denitrogening model organic compounds. The following progress had been made: (a) after much experimentation, a heated, packed percolation column containing the nickel-based desulfurization agent has been devised, which permits the efficient passage of SRC liquids in reasonable periods of time; (b) evaluations continue of combinations of poly(40-vinylpyridine) and alumina as the solid support, and modest desulfurization (20%) of the SRC liquid has been observed; (c) various pretreatments of poly(4-vinylpyridine) with sodium diethylaluminum hydride aim at affixing the reducing agent to the polymer by hydralumination of the pyridine nucleus, thereby immobilizing the reductant and eventually the nickel reagent; (d) regeneration of nickelsulfide-containing columns by treatment with acetylacetone alone is not feasible, but stronger acids appear promising; and (e) although $NaAlEt_2H_2$ and various salts (Ti, Cr, Ni, Mo) were unreactive toward N-benzylcarbazole, a combination of lithium metal and titanium or nickel salts did cleave C-N bonds to form carbazole and some ammonia.

1765 **(DOE/PC/40797—T1) Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, June 1, 1983-August 31, 1983.** Knickle, H.N. (Rhode Island Univ., Kingston (USA). Dept. of Chemical Engineering). Sep 1983. Contract FG22-81PC40797. 38p. NTIS, PC A03/MF A01. Order Number DE84000331.

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Gas holdup measurements were made for air and aqueous carboxymethyl cellulose solutions using a 13-inch acrylic column. It was concluded that: rheological properties can affect gas holdup in bubble columns, liquid velocity affects gas holdup in the bubble flow pattern, the bubble to bubble-slug transition is dependent on viscosity, and the effect of alcohol on two-phase flow parameters was extreme.

1766 **(DOE/PC/41755—T1) Nonstandard aging tests on coal-derived distillate fuel. Final report, July 7, 1981-July 6, 1983.** Bowden, J.N. (Southwest Research Inst., San Antonio, TX (USA)). 7 Aug 1983. Contract AC22-81PC41755. 23p. NTIS, PC A02/MF A01. Order Number DE84002154.

The aging procedure employed in this program to evaluate the stability of coal-derived liquid did distinguish between stability characteristics of the five materials evaluated. In most cases, the aliquots stored under nitrogen yielded the same or lower level of gums and precipitate than those stored under air. The effect of prefiltration was inconsistent. In some cases, the filtered aliquots produced more gums and precipitate than the unfiltered ones. Mostly, however, the filtered samples had less than the unfiltered ones. Even though in some instances the soluble gum formed was substantial, the composition of the bulk liquid did not change as evidenced by the constant composition of each fuel, measured by elemental composition, throughout the 24-week aging period.

1767 **(DOE/PC/50051—T3) Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983.** Gallier, P.W.; Boston, J.F.; Wu, P.C.; Yoon, E.S. (Aspen Technology, Inc., Cambridge, MA (USA)). 15 Oct 1983. Contract AC22-82PC50051. 128p. NTIS, PC A07/MF A01. Order Number DE84001663.

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This report documents the results of the second phase of Task 2, the purpose of which was to compare the ability of three models to represent the vapor-liquid equilibria (VLE) behavior of coal liquid systems. The comparison was based on selected sets of binary VLE data involving four key gaseous components with several solvents typical of coal liquids. The BWR equation was the best model among those considered. It was then used in the work of Task 3, the results of which are also documented in this report. The purpose of this task was to perform flash calculations and compare calculated results with data from selected sets of carefully recorded SRC-II P99 pilot plant runs of four flash separaters. Good matches between calculated and experimental data were found. The work serves as an example of a definitive bridge between physical property research and process design. It further shows that the ASPEN process simulator can serve as a reference data system for information recorded in the PETC Liquid Technology Data Base.

1768 **(DOE/PC/50057—T4) Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries.** Albal, R.; Brainard, A.; Godbole, S.; Kelkar, B.; Kulkarni, A.; Shah, Y.; Tierney, J.; Wender, I. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). Oct 1983. Contract FG22-82PC50057. 535p. NTIS, PC A23/MF A01. Order Number DE84002642.

The published and the unpublished non-proprietary data and calculations available on various scale coal liquefaction units were used to carry out a review of several aspects of reaction kinetics and reactor performance. The performance of a coal liquefaction reactor depends not only on the intrinsic kinetics but also on prevailing hydrodynamic, mixing and mass transfer characteristics. The scale-up of the reactor also depends on how faithfully one can predict or reproduce its characteristics in larger sized reactors. The literature for simple air-water, two- and three-phase bubble column reactors is analyzed and the suitability of existing correlations for coal liquefaction reactors is discussed. Kinetic models for coal liquefaction are evaluated. The models are divided into three categories: rate models, lumped models, and correlation models. All these models, however, have a basic drawback, that the applicability is restricted to the experimental data on which the model is based. Hydrogen consumption kinetics and the thermal behavior of coal liquefaction reactors are considered. Hydrogen consumption is one of the major operating costs in direct coal liquefaction. Hydrogen consumption depends on reaction temperature, hydrogen partial pressure, nature and concentration of catalyst (recycle ash content in the case of the SRC-II process) and slurry residence time. It is important to know the thermal behavior of a large scale reactor as a function of reaction operating conditions including reactor inlet temperature, pressure, slurry residence time, nature of coal, solvent, and concentration of coal and catalyst in the slurry phase. The thermal behavior of the SRC-II reactor is discussed with the possibility of existence of multiple steady states, and the ways to control them.

1769 **(DOE/PC/50793—T1) Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982.** Curtis, C.W.; Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA)). 1983. Contract FG22-82PC50793. 19p. NTIS, PC A02/MF A01. Order Number DE83013233.

The overall objective of the program is to determine if relatively hydrogen-rich petroleum fractions can be used to liquefy coal such that the net yield of liquids from the combined coal-residuum process is enhanced. In essence, simultaneous upgrading would transform both coal and petroleum resid into lighter synthetic fuel products of higher value. The work plan is divided into three major areas of investigation. Liquefaction screening program using both catalytic and non-catalytic processing; chemical characterization using both solvent extraction as well as various spectroscopic methods; parametric evaluation and optimization of the reaction conditions for maximum utilization of the heavy petroleum fractions and coal. Work was initiated on the project during this first quarter. The major accomplishment was a detailed review of the literature concerning the combined processing and upgrading of coal and petroleum resids. This review is included in the body of this report. Work was also initiated in planning of experiments and obtaining samples of petroleum crudes and resids, which will be supplied by Cities Service Research and Development Company. 20 references.

1770 **(DOE/PC/50793—T2) Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983.** Curtis, C.W.; Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA)). 1983. Contract FG22-82PC50793. 22p. NTIS, PC A02/MF A01. Order Number DE83013440.

The overall objective of the program is to determine if relatively hydrogen-rich petroleum fractions can be used to liquefy coal such that the net yield of liquids from the combined coal-residuum process is enhanced. During the quarter, work proceeded in two areas, (1) an experimental evaluation of the potential for coal dissolution with petroleum crudes and resids, (2) an investigation of the change in pore diffusivity in catalyst pellets due to the processing of coal derived materials. Detailed progress in the first area is reported in the body of this report. From the work performed thus far, it appears that the petroleum derived materials do not perform as well as tetralin in the liquefaction of coal. These results indicate that a catalyst may be required to obtain sufficient liquefaction yields utilizing the petroleum-based solvents. Based on knowledge from previous work, it is anticipated that catalyst lifetime and pore diffusivity considerations will be major factors when using supported catalysts, e.g. Ni-Mo/$Al_2O_3$, to process these materials. Thus, some work in this area has been initiated as noted above, and will be reported on in detail in the next quarterly report. 6 references, 2 figures, 10 tables.

1771 **(DOE/PC/50793—T4) Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983.** Curtis, C.W.; Guin, J.A.; Tarrer, A.R. (Auburn Univ., AL (USA)). 1983. Contract FG22-82PC50793. 26p. NTIS, PC A03/MF A01. Order Number DE84001012.

The overall objective of the program is to determine if relatively hydrogen-rich petroleum fractions can be used to liquefy coal such that the net yield of liquids from the combined coal-residuum process is enhanced. The work plan is divided into three major areas of investigation: liquefaction screening program using both catalytic and non-catalytic processing; chemical characterization using both solvent extraction as well as various spectroscopic methods; parametric evaluation and optimization of the reaction conditions for maximum utilization of the heavy petroleum fractions and coal. During the quarter work proceeded in several areas. Coal liquefaction experiments were performed with additional petroleum materials as solvents. These additional petroleum solvents were also characterized by solubility separation. Experiments were performed to determine the diffusivity of model compounds into catalyst extrudates withdrawn from coal liquids ebullated-bed hydrotreaters. Model compound experiments and coal liquefaction experiments were also performed using catalyst extrudates withdrawn from the hydrotreater units. 15 tables.

1772 **(DOE/PC/60796—1) Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983.** Stock, L.M. (Chicago Univ., IL (USA)). 1983. Contract FG22-83PC60796. 22p. NTIS, PC A02/MF A01. Order Number DE84002764.

Work during the first quarter concerned the hydrogen atom abstraction reactions of macerals. The influence of macerals from several bituminous coals on the hydrogen-deuterium exchange reac-

tion between tetralin-$d_{12}$ and diphenylmethane and on the reduction of fluorenone have been studied. The sporinite-rich exinites are more effective promoters of the exchange reaction than the corresponding vitrinites or alginite. The semifusinite-rich inertinites are even less effective promoters of the exchange reaction. More important, they are less selective in reactions with tetralin. The presence of sulfur containing compounds in the macerals has a notable influence on their reactivity in hydrogen transfer reactions. The reactivity pattern for the reduction of fluorenone - sporinite > vitrinite > alginite > semifusinite > fusinite > resinite - defines a bell shaped dependence on the H/C ratio of the maceral and presumably reflects the quantity of readily oxidized hydroaromatic compounds in the maceral. The differences in the effectiveness of the macerals depends in part upon their ability to initiate the reduction of the ketone and in part upon the facility with which they undergo oxidation. As a consequence, there may be synergistic interactions between the components of the different macerals in oxidative hydrogen transfer processes.

1773 **(NP—3770421) Desulfurization of hot reductive gases by means of metal oxides.** Proy, G. (Technische Univ. Berlin (Germany, F.R.). Fachbereich Verfahrenstechnik). 27 Aug 1981. 141p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770421.

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In connection with coal gasificattion and subsequent direct reduction, electric current generation or synthesis gas production advantages are achieved by use of hot gas desulfurization especially with respect to efficient energy utilization. The desulfurization is carried out above ca. 700 K, either only with metals or with metal oxides; the use of metals is nearly negligible. It is shown that only hydrogen sulfide and carbon oxysulfide occur as sulfur compounds in hot reductive gases. In using different metal oxides, CaO is most appropriate for desulfurization of reduction gases. Experiments in the fixed bed reactor showed that the calculated concentrations of hydrogensulfide and carbon oxysulfide are approximated. When knowing the flow conditions in the catalyst, the sulfur adsorption velocity can be determined with sufficient accuracy.

1774 **(NP—3770426) Reduction gas and artificial gas from Rhine crude lignite by application of tube furnace gas generator.** Beckervordersandforth, C.P. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 21 Nov 1975. 156p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83770426.

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This treatise aims at utilisation of native lignite. In the first part of the treatise experiments of vaporizing crude lignite in a tube furnace gas generator at 850°C are described. The following results were obtained: 1. from 700°C on a complete carbon conversion for lignite containing 60% by weight water is possible, 2. increasing vaporization pressure over 60 bar doesn't influence thermodynamically the gas quality in respect to $CH_4$, $H_2$ and CO and 3. the maximum gas content of CO and $H_2$ is obtained at a water content of the initial lignite of 42% by weight. These experiments were done in two equipments of 1 m and 2.5m length and show the same trends as a function of tube length and quantity delivered. The tube furnace gas generator is divided into a low temperature zone (until about 550°C) in which the intrinsic water vaporizes and the volatile components are expelled and a high temperature zone (until 850°C) in which carbon reacts with water yielding the gas ($H_2$:53.5%, CO:24%, $CO_2$:16%, $CH_4$:3,5%, $N_2$:2,5%, Csub(n)Hsub(m):0,5%). The second part treats the technical realization of vaporization of lignite containing intrinsic water, the feeding of which from a fluid bed into a horizontal tube was examined successfully. From the results a nomogram for determination of tube number as a funtion of pressure, heat transfer medium, tube diameter and tube length, lignite feeding and lignite quantity was determined. Throughput limiting value is that velocity at which lignite is transported in fluid flow through the tube.

1775 (ORNL—5933, pp 34-49) **Fossil energy.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

Research carried out on coal liquefaction is described.

1776 **(PB—83-242628) Fossil fuel gasification technical evaluation services. Final report 1978-83.** Johnson, C.D. (Braun (C.F.) and Co., Alhambra, CA (USA)). May 1983. 555p. NTIS, PC A24/MF A01.

Technical evaluations performed prior to 1981 were published as a separate document, Topical Reports 1978-1980, by C F Braun and Co, November 1982, Report No. GRI-80/0168. These evaluations include the Cities Service-Rockwell, Exxon Catalytic, Mountain Fuels, Slagging Lurgi, U-Gas, and Westinghouse processes for coal gasification, the Peatgas process for peat gasification, the GE Membrane process for acid gas removal, and an integrated test facility for use in the development of gasification processes. Evaluations performed in the 1981 to 1983 period are included in the present document, the Final Report. These evaluations include the Westinghouse process for coal gasification, the Engelhard, Stone and Webster and Texaco processes for gasification of coal derived liquids, the Catalysis Research Corporation (CRC) process for direct methanation of raw gas streams, and the CNG Research Company process for removal of acid gases from coal gasification process streams. Other recent investigations include the evaluation of materials of construction, fundamental design data, and heat recovery technology for coal gasification processes.

1777 **(PB—83-243964) Fundamental investigations of underground coal gasification. Annual report Mar 82-Mar 83.** Dunn, R.D. (Wyoming Univ., Laramie (USA)). Mar 1983. 30p. NTIS, PC A03/MF A01.

Coal deposits in the Appalachian and Midwest Coal Regions consist primarily of thin relatively deep seams of swelling bituminous coal, but little scientific effort in the United States has been directed toward underground coal gasification in these important industrial areas. In Europe, however, major work is under way on underground coal gasification in thin, deep seams of swelling coal. The principal investigator and a graduate student are participating in field tests in Belgium and supporting laboratory experiments in Germany. Mathematical models are being developed to interpret these experimental data, and a better understanding of the underground coal gasification process is emerging. This understanding is essential for evaluating potential problems, for devising solutions to such problems and for designing field tests.

1778 **(PB—83-244020) Laser micropyrolysis of coal macerals. Final report Oct 79-Mar 83.** Vastola, F.J.; McGahan, L.J. (Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering). 26 Apr 1983. 162p. NTIS, PC A08/MF A01.

A technique has been developed which is capable of analyzing individual coal macerals in situ in a time-of-flight mass spectrometer via laser pyrolysis. A high degree of reproducibility and sensitivity is achieved by spectral averaging. The pyrolysis spectra from 35 different coals were found to be dependent upon coal rank, province, and region. Within the Rocky Mountain province, the high rank coal spectra were dominated by alkyl naphthalenes to various degrees of substitution, whereas the low rank coal spectra were dominated by alkyl benzenes. The maceral distribution in some coals was found to cause an anomalous ASTM rank classification. Computerized data reduction and analytical techniques allowed for quantitative comparisons to be made between coals. Evolution of C4 aliphatic hydrocarbons, C2 and C3 alkyl benzenes, and C2 and C3 alkyl naphthalenes were found to be the most sensitive to structural changes in the coals. Correlations between the pyrolysis spectra and conventional parameters of coal characterization such as reflectance, calorific value, and oxygen percentage were observed.

1779 **(PB—83-250001) Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79.** Hill, A.H.; Anderson, G.L.; Fleming, D.K. (Institute of Gas Technology, Chicago, IL (USA)). Aug 1983. 55p. NTIS, PC A04/MF A01.

The report gives results of a theoretical investigation of the disposition of five volatile trace elements (arsenic, boron, lead, selenium, and mercury) in SNG-producing coal gasification plants. Three coal gasification processes (dry-bottom Lurgi, Koppers-Totzek, and HYGAS) were investigated to examine the possible ef-

fects of gasifier operation conditions on the speciation of the volatile trace elements. Results of this investigation suggest that none of the trace elements considered in this study will be present in the product SNG from a coal gasification plant, but will be removed from the fuel gas by various unit operations. Results also suggest that speciation of these volatile trace elements is not significantly affected by gasifier conditions.

1780 **(PB—83-254938) Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78.** Johnson, J.L.; Tran, D.Q. (Institute of Gas Technology, Chicago, IL (USA)). Nov 1980. 117p. NTIS, PC A06/MF A01.

The reaction rate and products of initial-stage coal devolatilization were measured. Five noncaking coals were studied: Montana, North Dakota, Darco (Texas), and Wilcox (Texas) lignites, and Montana subbituminous coal. Experiments were conducted in a specially constructed 200-foot-long dilute-phase solid transport reactor with residence times ranging from 5 to 10 seconds. Coal particle sizes ranged from 0.0029 to 0.0035 inch. They were subjected to a constant heating rate and isothermal conditions, with temperatures up to 1600F. Helium, hydrogen, and hydrogen-helium mixtures were used at pressures ranging from 260 to 780 psia. Data analysis included the development of a detailed kinetic model, based on experimental and literature data on the devolatilization of Illinois No. 6 bituminous coal.

1781 **(VTT-TIED—215) High pressure hydrogenation of solid fuels.** Solantausta, Y.; McKeough, P. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 64p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Research on the hydrogenation of solid fuels is studied generally by reviewing its background, development and experimental activities. Experimental alternatives of direct liquefaction are especially considered. The hydrogenation of coal is discussed concisely, and starting points of research on biomass hydrogenation developed on its basis are presented. Effects of the chemical and physical structure and properties of raw materials on the mechanisms of hydrogenation are studied by comparing peat and coal with each other. Liquid products obtained by hydrogenation and their analysing are presented. Finally, the testing equipment used in hydrogenation research and resources required are reviewed. The organization of batch tests is studied in detail.

1782 **Evaluation of coking behavior in coal liquefaction process equipment.** Lin, K.H.; Frazier, G.C.; Edwards, R.E. Jr. (Oak Ridge National Lab., TN). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 831-837(Aug 1982). Contract W-7405-ENG-26.

Formation/deposition of coke-like solids in process equipment represents one of the crucial problems in coal liquefaction processes, yet the causes for such behavior are not well understood. This paper presents the results of the state-of-the-art review in understanding coking behavior, with an emphasis on possible application to coking in coal liquids. Accessible data from the literature relevant to coking are concerned primarily with petroleum liquids and appear to be scattered, largely qualitative in nature, and sometimes inconclusive. Few experimental coking studies have been made using coal-derived liquids. Preliminary dimensional correlations that resulted from a comprehensive analysis of the coking data liquefaction pilot plant are also presented. The correlations indicate process conditions and certain coal characteristics that may lead to incipient coke formation. Further studies and additional data are required to refine these correlations.

1783 **Dissolution of coal in solvents.** Ebnesajjad, S. Ann Arbor, MI; Univ. of Michigan (1982). 349p. University Microfilms Order No. 83-04,483.

Thesis (Ph. D.).

Experimental studies were effected in a 1-liter batch reactor to determine the role of the solvent and temperature on the dissolution of a Kentucky No. 9 coal. The goal was to increase the dissolution yield, defined as conversion of coal to pyridine-soluble material, while decreasing the hydrogen demand. The experiments were carried out in the absence of hydrogen gas. The solvent and coal were heated at a constant rate of temperature rise to 300 to 400°C and held at a constant temperature for periods of 0 to 50 minutes before rapidly quenching the reaction mixture. 2-Methylnaphalene, 1,2,3,4-tetrahydronaphthalene (tetralin), p-cresol or $\beta$-naphthol, and $\gamma$-picoline were used in different ratios as the solvent. These compounds represented, respectively, the polycondensed aromatics, hydroaromatics (hydrogen donor), monophenols, and basic nitrogen compounds found in coal liquefaction recycle solvents. Dissolution yield of the coal reached a maximum in a solvent containing equal parts of 2-methylnaphthalene and tetralin. The H/C ratio of the preasphaltenes remained virtually constant when the tetralin content ranged from 20 to 65 wt % in mixtures with 2-methylnaphthalene. A slight increase was noted when pure tetralin was the solvent. Addition of small amounts of $\beta$-naphthol and $\gamma$-picoline to a 1:4 weight ratio of tetralin and 2-methylnaphthalene improved the dissolution yield. Coal was dissolved with no or minor chemical reactions up to the temperature of $\sim$ 340°C in a solvent containing 46.1 wt % tetralin, 46.1 wt % 2-methylnaphthalene, 4.9 wt % $\beta$-naphthol, and 2.9 wt % $\gamma$-picoline. Beyond this temperature dissolution yield increased exponentially typical of thermal cracking reactions.

1784 **Catalysts for upgrading solvent refined lignite.** Kim, N.K. Bozeman, MT; Montana State Univ. (1982). 141p. University Microfilms Order No. 83-05,446.

Thesis (Ph. D.).

The solvent refined lignite (SRL), made at the University of North Dakota Process Development Unit, was a solid having a nominal melting point of 160°C. The SRL was pulverized and mixed with a donor solvent, tetralin. The SRL to tetralin ratio of 1:1 was selected to pretreat in a high pressure and temperature reactor. The optimized reactor conditions were a reaction temperature of 475°C, an initial hydrogen pressure of 2000 psig and a retention time of 40 minutes. Under these conditions approximately 97% of the SRL was dissolved in tetralin. The resulting solution was used to test the 27 developmental catalysts. The catalysts were developed by impregnating on the $\gamma$-alumina the 3 active metals; $MoO_3$, CoO, and $WO_3$, each at 3 levels. The effect of these factors on upgrading of the SRL was evaluated in terms of denitrogenation, desulfurization, and hydrocracking. The multiple linear regression analysis showed that the metal compositions for the best overall catalytic performance were 9.5% $MoO_3$, 4.3% CoO, and 4% $WO_3$ (% of carrier weight). A model was developed based on the results of scanning electron micrographs to explain some of the physical characteristics of the catalysts. The disadvantage of the incipient wetness method used in metal impregnation was explained, and the preferable pore structure and distribution were suggested.

1785 **Importance of catalysis and carbon active sites in lignite char gasification.** Radovic, L.R. University Park, PA; Pennsylvania State Univ. (1982). 302p. University Microfilms Order No. 83-05,686.

Thesis (Ph. D.).

A detailed study of the gasification of a North Dakota lignite was undertaken. Chars were prepared from raw and pretreated lignite under widely varying conditions of pyrolysis heating rate, temperature and residence time. Coal pretreatment consisted of essentially complete demineralization, selective removal of exchangeable cations and selective cation loading. Rapid pyrolysis was performed in an entrained-flow reactor. Slow pyrolysis was effected in a horizontal-tube furnace. The gasification reactivity of the chars was determined by isothermal thermogravimetric analysis mostly in 0.1 MPa air, but also in 0.1 MPa $CO_2$ and 3.1 kPa $H_2O$. A detailed analysis of the surface properties of the chars was performed. A very wide range of reactivities of the chars was achieved by varying the conditions of coal pyrolysis and pretreatment. It was shown that total surface area is not a relevant parameter. In the predominantly uncatalyzed gasification, the concentration of carbon active sites was shown to be the relevant index of reactivity, both for the demineralized lignite chars and for carbons of increasing crystallinity, from Saran char to natural graphite. In the case of raw (Ca-containing) lignite chars, it was shown that CaO is the predominant catalyst responsible for the relatively high gasification reactivity of lignite compared to higher-rank coals. Litnite char gasification should be regarded, therefore, as a catalyzed gas-solid reaction, with the catalyst dispersion being the relevant reactivity parameter.

Indeed, when the rates are expressed as turnover frequencies, observed differences per unit mass of char as large as two hundred times are reduced to within one order of magnitude. Thus, the commonly observed and heretofore empirically treated coal char deactivation with increasing severity of pyrolysis conditions was correlated with a decrease in measurable fundamental properties of the chars: carbon active surface area and catalyst dispersion.

1786 **Systematic chemical-catalytic study of coal structure under subsoftening conditions.** Oblad, H.B. Salt Lake City, UT; Univ. of Utah (1982). 281p. University Microfilms Order No. 83-06,218.

Thesis (Ph. D.).

This work concerned the elucidation of coal structure by analysis of solubilization products obtained under mild (subsoftening) conditions. A systematic study of $ZnCl_2$-catalyzed low-temperature hydrotreatment of coal was carried out. The effects of retention time (0 to 60 min.), hydrogen pressure (0.1 to 13.8 MPa), catalyst concentration (0 to 50% by wt.) and reaction temperature (275 to 390°C) upon the yield and distribution of soluble product fractions, i.e., oils, asphaltenes, and asphaltols, were determined. Coal-derived oils, asphaltenes, and asphaltols were subjected to structural analysis by elemental analysis, molecular weight determination by VPO, and detailed Fourier Transfor Infrared (FTIR), PMR, and $C^{13}$ NMR spectral analysis. The results allowed determination of structural changes as a function of the experimental conditions. The analytical data were applied in structural analysis calculations using the CMR and Modified Brown-Ladner methods. Average molecular structures for oils, asphaltenes and asphaltols obtained by low-temperature $ZnCl_2$-catalyzed hydrosolubilization of New Mexico coal was derived and structural model for New Mexico coal was developed. The initial stage of the process involves depolymerization of the coal framework into oils, asphaltenes, and asphaltols by cleavage of labile intercluster links such as alkylene and benzyletheric groups. The asphaltols and asphaltenes undergo additional depolymerization by cleavage of more stable intercluster links such as diphenyletheric and dibenzofuranic groups, as well as diaryl C-C bridges. This additional depolymerization leads ultimately to the formation of oils which represent the limiting products of the low-temperature process.

## 0106 Properties

*REFER ALSO TO CITATION(S) 1774, 1811*

1787 **(CONF-830807—14) Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals.** Pugmire, R.J.; Woolfenden, W.R.; Mayne, C.L.; Karas, J.; Grant, D.M. (Utah Univ., Salt Lake City (USA)). 1983. Contract FG22-82PC50812. 9p. NTIS, PC A02/MF A01. Order Number DE84000512.

From International conference on coal science; Pittsburgh, PA, USA (15 Aug 1983).

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Data are reported on a series of whole coals and coal macerals using conventional cross-polarization magic spinning nuclear magnetic spectroscopy (CP/MAS), dipolar dephasing, and 2-D dipolar dephasing techniques. These data provide a wealth of new structural information and demonstrate that multiple pulse and 2-D spectroscopic techniques can be utilized on complex carbonaceous materials. Data obtained on maceral samples separated by the density gradient centrifugation method are also presented. 15 references, 1 figure, 1 table.

1788 **(CONF-8210100—7) Effects of hydrotreatment on the composition of mutagenic fractions of a coal-derived petroleum substitute.** Buchanan, M.V.; Flanagan, J.; Rubin, I.B.; Guerin, M.R. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE84001992.

From 7. international symposium on polynuclear aromatic hydrocarbons; Columbus, OH, USA (26 Oct 1982).

Coal- and shale-derived product oils differ from petroleum crudes by being more highly aromatic and by containing a greater quantity of heteroatomic species. Catalytic hydrogenation (hydrotreatment) is commonly used to improve both handling and use properties. In this study, the basic and neutral polar compounds of a crude coal derived liquid and three products from this crude which have been subjected to low, medium, and high severity hydrotreatment have been isolated and chemically characterized to determine whether hydrotreatment resulted in a selective reduction of a few N-containing and aromatic components or a general reduction of all components. 8 tables.

1789 **(DOE/PC/30013—4) Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties.** Kuehn, D.W.; Davis, A.; Painter, P.C. (Pennsylvania State Univ., University Park (USA). Coal Research Section). Aug 1983. Contract AC22-80PC30013. 260p. NTIS, PC A12/MF A01. Order Number DE84000539.

The Lower Kittanning coal seam covers a vast area of the Allegheny Plateau in Pennsylvania, Ohio, West Virginia, and Maryland. Throughout its extent, the chemistry of the coal varies considerably. Variabiilty in the organic constituents of the Lower Kittanning seam was determined by Fourier transform infrared spectroscopy and analysis of optical properties. Thirty-three whole-seam channel samples were collected in western Pennsylvania and eastern Ohio. From 24 of these samples, vitrinite concentrates were obtained by hand picking the bright bands in the coal. Reflectances in air and oil immersion were determined for the vitrinite concentrates for five wavelengths of visible light. Refractive and absorption indices were calculated from the reflectance measurements and dispersion curves were constructed for these four variables. The channel samples and vitrinite concentrates were analyzed by Fourier transform infrared spectroscopy (FTIR). The relations between regions of the FTIR spectra and some liquefaction and fluid properties of coals are also described. The underlying geologic controls of the variation in the characteristics of this coal seam are examined.

1790 **(DOE/PC/30249—T6) Development of a thermodynamic-properties correlation framework for the coal-conversion industry. Final report, September 1, 1980-August 31, 1983.** Starling, K.E.; Lee, L.L.; Watanasiri, S.; Kumar, K.H.; Brule, M.R.; Chung, T.H.; Luong, T.H.; Owens, V.H.; Khalil, M.A.; Khan, M.A. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 1983. Contract FG22-80PC30249. 110p. NTIS, PC A06/MF A01. Order Number DE84002734.

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The objectives of this research project are to: develop a thermodynamic properties correlation framework for pure coal fluids; extend the framework to prediction of thermodynamic properties of defined binary mixtures; develop correlations for the correlation characterization parameters in terms of routinely measured variables; and develop methods for applying the thermodynamic and characterization correlations to undefined coal systems in ways which make the results useful for design. This report is organized into 5 sections. The mean potential model equation of state developed in this research is presented in section I. Application of the correlation to predict the thermodynamic properties of nonpolar, polar, and associating pure compounds is presented in section II. In section III, property predictions for defined mixtures are discussed. Methods for applying the correlation to undefined mixtures are presented in section IV. In section V, the results of enthalpy, volatility, bubble point, and K-value calculations for several actual coal-fluid systems are presented. 144 references, 5 figures, 25 tables.

1791 **(DOE/PC/40783—T12) Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983.** Jordan, J.; Sexton, E.; Stahl, J.; Talbott, J.; Yakupkovic, J. (Pennsylvania State Univ., University Park (USA)). Oct 1983. Contract FG22-81PC40783. 22p. NTIS, PC A02/MF A01. Order Number DE84002604.

Task 1. Methods development for the speciation of the polysulfides. Thermometric enthalpy titration of a mixture of $HS^-$, trisulfide and tetrasulfide with thallous nitrate yielded a single endpoint corresponding to the sum $[HS^-] + [S_3^{2-}] + [S_4^{2-}]$. The heat

evolved (ΔH/sub obs/ = -138 kJ/mol of thallium) was the weighted average of the heats of the reactions: $2Tl^+ + HS^- + OH^- = Tl_2S(s) + H_2O$; $2Tl^+ + S_3^{2-} = Tl_2S_3(s)$; $2Tl^+ + S_4^{2-} = Tl_2S_4(s)$. Task 2. Methods development for the speciation of dithionite and polythionates. In a solvent consisting of 40% ethanol and 60% water, coulometric current-time integrals substantiated the occurrence of the following electrode reactions: $S_2O_6^{2-} + 2e = S_2O_3^{2-} + SO_3^{2-}$; $S_4O_6^{2-} + 2e = 2S_2O_3^{2-}$; $S_5O_6^{2-} + 4e + 2H_2O = 2S_2O_3^{2-} + H_2S + 2OH^-$. Corresponding polarographic diffusion currents are amenable to the analysis of mixture of polythionates. Task 3. Total accounting of the sulfur balance in representative samples of synfuel process streams. Analyses of three aqueous liquefaction specimens, a Disposable Catalyst Development (DCD) process effluent from Pittsburgh, PA, and two effluents generated by three separate process units from Wilsonville, AL, were undertaken. The Wilsonville effluents resulted from sampling at different wastewater treatment steps. Thiosulfate and sulfate were observed in the Wilsonville effluents. The DCD process effluent contained only hydrogen sulfide and polysulfides. 8 references, 2 figures, 5 tables.

1792 **(DOE/PC/50811—T2) High P/T phase and volumetric behavior of coal-liquid constituents. Quarterly report, July 1, 1983-September 30, 1983.** Kobayashi, R. (Rice Univ., Houston, TX (USA). Dept. of Chemical Engineering). 1983. Contract FG22-82PC50811. 3p. NTIS, PC A02/MF A01. Order Number DE84002732.

During this quarter a simple, generalized correlation for the prediction of vapor pressures of coal liquid model compounds extending to normal fluids has been developed. Renormalization group theory results have been combined with the corresponding states principle to yield a correlation applicable from the freezing point to the critical point. The vapor pressures are obtained through integration of the Clapeyron equation, using a generalized correlation for the latent heats of vaporization and a generalized expression for the compressibility factor difference between the vapor and liquid. The vapor pressure correlation has been successfully tested for twenty-three pure components, including aromatic and heterocyclic compounds, in the region 0.31T/sub c/ < T < T/sub c/. The deviation of predicted vapor pressures from experimental values is in the range 0.11 to 5.45 percent. Work is under way to modify an existing apparatus for the measurement of PVT and VLE data. The apparatus should be ready for testing sometime in early 1984. When testing is completed the first order of business will be to measure pure component liquid densities of coal liquid model compounds. The results will be combined with vapor pressure measurements to obtain liquid phase fugacities.

1793 **(PB—83-243980) Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83.** Solomon, P.R. (Advanced Fuel Research, Inc., East Hartford, CT (USA)). Apr 1983. 122p. NTIS, PC A06/MF A01.

This document pertains to the synthesis and determine the pyrolytic reactivity characteristics of polymer models representative of coal structural features in order to define how variations in chemical structure and reactivity of coal's key structural elements influence its pyrolytic reactivity characteristics.

1794 **(PB—83-253765) Moisture determination by microwave heating.** (British Carbonization Research Association, Chesterfield). Dec 1981. 16p. NTIS, PC E03/MF E03.

A limited study was made of the feasibility of determining the moisture content of solid fuels using microwave heating. Samples of coal, lignite coal slurry and cokes were heated in a microwave oven. The loss of moisture was noted in relation to the length of time of heating and the rate of power supply. These results were compared with existing standards. Rapid drying of solid fuels was possible using microwave heating, but caused some localized overheating, particularly with coal samples. It was concluded that if a suitable means of monitoring the heating process were developed, then the technique would be more useful, with moisture values of within 1 per cent of the absolute value being possible. However, the technique would be useful in the rapid drying of certain materials under field conditions, e.g. wet slurries, where an absolute moisture value is not essential.

1795 **(VTT-TUTK—175) Propertier of indigenous fuels. Part 3. Readily volatile compounds of peat.** Lappi, M.; Ranta, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Apr 1983. 46p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Thermal sensitivity of fuel peat was studied by dry distillation of peat under different heating conditions (time, temperature) and by studying the distillates in a gas chromatograph and in a mass spectrometer. A conception was obtained about the quality, volatility and relative abundance of volatile organic substances. It was also evaluated whether the compounds were free substances or reaction products due to heating. The main components were determined quantitatively. The most volatile components were trapped by collecting them first in adsorption resin or by concentrating them directly into the cold trap of the gas chromatograph. Aliphatic alkanes, alkenes, ketones and aldehydes, aromatic hydrocarbons, carboxylic acids, furfural and furans, phenols and nitrogen heterocycles were found to be typical volatile component groups.

## 0108 Waste Management

*REFER ALSO TO CITATION(S) 1773*

1796 **(AD-A—132041/5) Studies of the constitution of fly ash using selective dissolution. Final report.** Buck, A.D.; Husbands, T.B.; Burkes, J.P. (Army Engineer Waterways Experiment Station, Vicksburg, MS (USA). Structures Lab.). May 1983. 40p. NTIS, PC A03/MF A01.

Selective removal of the glassy phase from a fly ash permits determination of its amount and removes it as a diluent from the fly ash residue which if not removed, interferes with identification of crystalline phases by X-ray diffraction (XRD) or other methods. Tried and evaluated went several types of selective chemical dissolution to determine glass content. Changes in mass as measures of amount of glass and the crystalline phases in the residues were identified by XRD or optical microscopy. All chemical treatments that were tried had the disadvantage that none made an absolutely clean separation between glassy and crystalline phases. The two best methods were a treatment with fluosilicic acid and one with sodium hydroxide. Chemical dissolution was a useful tool to estimate glass content and to assist in identification of crystalline phases. It was judged that fluosilicic acid method to be the preferred procedure to estimate glass content of a fly ash. Data is given for four lignite ashes, one subbituminous ash, and one bituminous ash. Glass contents ranged from 57 to 75 percent. Chemical analysis showed the presence of barium, titanium, strontium, and manganese in addition to other elements usually reported. Identified are several phases similar to minerals containing these elements. It may not always be possible to determine whether a minor crystalline phase in the residue after chemical dissolution is an original mineral constituent of the coal, and original phase in the ash, or a product of the chemical treatment of the ash.

1797 **(DOE/PC/30238—T1) Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982.** Clark, R.D.; Sveum, L.K. (New Mexico Highlands Univ., Las Vegas (USA). Div. of Science and Mathematics). 30 Mar 1983. Contract FG22-80PC30238. 105p. NTIS, PC A06/MF A01. Order Number DE84001859.

Two methods to control coal fly ash particle size distribution have been studies. Mineral matter has been added to coal in an attempt to alter the thermal properties of ash material which in turn would control the particle size distribution. While most additives have had little effect on the size distribution, the number of ash particles generated increased by about a factor of two. Alkali metal additives do alter the size distribution by creating a second distribution peak at 0.75 μm in addition to the normal peak at 2.0 μm. It was discovered that removal of mineral matter by leaching high alkali lignite coal with hydrochloric acid removed the alkali metal peak in the distribution and lowered the total number of particles created by a factor of three. The combustion gas composition has been varied from a very low oxygen content to a very high oxygen content. As the oxygen content increased the coal particles burned hotter and generated many more particles and at the same time the

particle size distribution shifted from about 2 μm towards 0.75 μm. Changing the inert gas from nitrogen to carbon dioxide had no effect. 21 references, 29 figures, 9 tables.

1798 **(NP—3770424) Reduction of nitrogen monoxide by catalytically activated lignite coke.** Zentner, U. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 29 Jun 1979. 133p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770424.

Portions are illegible in microfiche products.

The thesis contains a chapter on theoretical foundations in which are described the formation, influence and occurrence of the nitrogen oxides and their removal from waste gases, as well as production, properties and use of lignite coke, the determination of kinetic data in a fixed bed packing reactor and the influence of diffusion on heterogeneous reaction on porous solid matters. The experimental part deals with description of equipment, gas analysis, characterization of used lignites, own experiments, discussion of error and experimental results. The discussion of experimental results is treated in a separate chapter.

1799 **(PB—83-232140) Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82.** Schmid, J.P.; Schmidt, M.R.; Colaizzi, G.J.; Whiate, R.H. (Goodson and Associates, Inc., Denver, CO (USA)). Dec 1982. 221p. NTIS, PC A10/MF A01.

Results of a comprehensive investigation of the impact of underground mine waste disposal on the health and safety of miners are presented. Information was gathered through an extensive search of U.S. and foreign literature and personal communication with professionals in private industry and government. All conceivable health and safety hazards directly or indirectly related to underground mine waste disposal are analyzed, catagorized, and ranked on an industrywide basis. Positive health and safety effects are analyzed and ranked in a similar way. Both potential and known hazards and positive impacts are included.

1800 **(PB—83-238519) Mine waste location by satellite imagery. Open file report 30 May 80-18 Dec 82.** Anuta, M.A.; Bahethi, O.P. (Science Systems and Applications, Inc., Seabrook, MD (USA)). Dec 1982. 100p. NTIS, PC A05/MF A01.

This report describes the potential for utilization of satellite observations for remote sensing of mine waste disposal areas. Four study sites consisting of metal and nonmetal mining areas in different climatic and physiographic regions of the contigous United States were used in the investigation. The mine waste disposal sites consisted of mining of phosphates in Florida, copper in Arizona, silver in Idaho, and coal in West Virginia. Landsat satellite multispectral scanner observations were used together with aerial photographs, ground surveys, U.S. Geological Survey maps, and other ancillary information. Landsat digital data were categorized using automated supervised classification algorithms and an image analysis system.

1801 **(PB—83-250118) Physical property data on coarse anthracite waste. Report of investigations.** Stewart, B.M.; Atkins, L.A. (Bureau of Mines, Spokane, WA (USA). Spokane Research Center). Jul 1983. 31p. NTIS, PC A03/MF A01.

Since 1974, a large amount of data has been developed concerning the physical properties and stability characteristics of waste generated by the mining and preparation of bituminous coal. However, very little information has been developed on the properties and characteristics of anthracite waste. During this Bureau of Mines research project, coarse anthracite breaker refuse from five sites in eastern Pennsylvania was sampled and the physical properties, which indicate stability characteristics, were determined in the laboratory. Stability analyses were conducted on six theoretical anthracite waste embankments. These analyses show the effects on minimum safety factors of geometry, phreatic surface level, and physical properties.

1802 **(PB—83-250902) Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations.** Jong, B.W.; McBee, W.C. (Bureau of Mines, Boulder City, NV (USA). Boulder City Engineering Lab.). Jul 1983. 18p. (BM-RI—8773). NTIS, PC A02/MF A01.

A bench-scale evaluation of coal and coal waste materials as aggregate materials for use in longwall mine supports was undertaken as part of the Bureau of Mines Health and Safety program on ground control. Performance data were obtained on portland cement concretes (PCC) prepared with coal and coal wastes as aggregate materials. The effects of high-early-strength accelerators on strength and creep and of super-plasticizers on strength properties of PCC formulated with coal and coal waste were investigated.

1803 **(PB—83-252833) Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83.** Rochelle, G.T.; Chan, P.K.R.; Toprac, A.T. (Texas Univ., Austin (USA). Dept. of Chemical Engineering). Aug 1983. 110p. NTIS, PC A06/MF A01.

The report gives results of the measurement of dissolution rates of reagent CaCO3 and commercial limestones (9 types/19 grinds) at constant pH and solution composition by batch titration with HCl. Conditions were selected to simulate flue gas desulfurization. A mass transfer model has been developed which includes theoretical effects of particle size and equilibrium acid/base reactions. The cumulative rate of mass transfer is calculated by integrating over a particle size distribution obtained by Coulter Counter and screening measurements.

1804 **(TVA/PUB—84/6) Computer economics of physical coal cleaning and flue gas desulfurization.** Wright, C.R.; Tarkington, T.W.; Kilgroe, J.D. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology; Environmental Protection Agency, Research Triangle Park, NC (USA). Industrial Environmental Research Lab.). 1983. 27p. (CONF-831155—1). NTIS, PC A03/MF A01. Order Number DE84900355.

From Symposium on flue gas desulfurization; New Orleans, LA, USA (1 Nov 1983).

A computer model that simulates the performance and calculates the economics of a coal-cleaning process, a flue gas desulfurization (FGD) process, and a combination of the two processes for electric utility boilers has been developed by the Tennessee Valley Authority (TVA) under sponsorship of the US Environmental Protection Agency (EPA). The model also determines other economic benefits and penalities to overall power plant operations that are associated with the use of cleaned coal. The model is described and its use is illustrated for selected design and economic premises. The present status of the model is assessed and possible future studies are discussed. The illustrative examples show that in some instances a combination of coal cleaning and FGD for $SO_2$ emission control can be more economical than FGD alone. For the cases studied, it was found that the use of coal cleaning in combination with FGD can have a varied effect on the levelized annual cost of power production. This effect, which is dependent on the coal and the specific operating conditions, ranges from a 0.5% increase to a 22.6% decrease in those costs. The methods used to determine many of the other economic benefits and penalties of coal cleaning are necessarily general in nature because detailed data relating specific coal properties to boiler performance and operating costs are scarce. Thus, development and incorporation of more detailed and quantitative data in the model would greatly increase the usefulness of the model in assessing overall economic effects of coal cleaning. 10 figures, 3 tables.

## 0109 Environmental Aspects

*REFER ALSO TO CITATION(S) 1803, 2884, 3263, 3409*

1805 **(PB—83-251850) Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83.** Hanschel, D.B.; Stemmle, J.T. (Environmental Protection Agency, Research Triangle Park, NC (USA). Industrial Environmental Research Lab.). Jul 1983. 578p. (EPA—600/8-83-027). NTIS, PC A25/MF A01.

The manual is intended as a technical aid to applicants, the U.S. Synthetic Fuels Corporation (SFC), and environmental reviewers in developing and reviewing plans covering source and ambient monitoring around coal-, oil shale-, and tar sand-based synfuels plants, consistent with the Energy Security Act. The Act, which established the SFC, specifies that applicants for SFC financial assistance must develop an acceptable plan for environmental monitoring of the construction and operation of the proposed synthetic fuels facilities, following consultation with the EPA and other agencies. The manual does not provide rigorous specifications for an acceptable monitoring plan. Rather, it describes approaches to consider and issues to address in developing a monitoring plan (or an outline of a plan). The exact content of the plan or outline for a specific facility would depend on conditions associated with that plant.

1806 **(PB—83-253740) Assessment of discharges from Sasol I Lurgi-based coal gasification plant. Final report Sep 81-Mar 82.** Thomson, S.J.; Kasper, G.; Nagy, J.F.; Tzou, A.; Pernot, L.S. (Fluor Engineers and Constructors, Inc., Irvine, CA (USA)). Aug 1983. 36p. NTIS, PC A03/MF A01.

The report discusses analytical information, obtained from Sasol I, on the emission and effluent streams analyzed in the normal course of operation and testing. The purpose was to provide EPA with representative information on a commercial-size Lurgi-based coal gasification project. The final report gives operating data and supplementary data, including material balances and pollutant distribution evaluations. Although much of this supplementary information is based on engineering estimates and calculations, it is believed to be representative of a Sasol I gasification operation. The data presented should be confirmed by a series of test runs before they are used for process design purposes, cost estimates, or environmental control studies.

## 0110 Reserves And Exploration

*REFER ALSO TO CITATION(S) 1805, 1890*

## 0120 Mining

*REFER ALSO TO CITATION(S) 1793, 1796, 1877, 1882*

1807 (DOE/METC—83-45, pp 48-49) **Containment of hydraulic fractures in coal seams by in situ stresses.** Hanson, M. (Hunter Geophysics, Mountain View, CA); Towse, D.; Thorson, L. Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

In mid 1980, a program was undertaken to determine if hydraulic fractures could be contained entirely within a coal seam. The goal was to utilize the effects of the in situ stress in the design and emplacement of the hydraulic fracture treatment. The program included site selection and identification of the geologic setting of the coal and surrounding material, measurement of the in situ stress in the coal and boundary rock material, design and application of hydraulic fracture treatment, and monitoring of mineout of the regions containing the hydraulic fractures. Concurrent with these field activities was the development of theoretical models to analyze and help design the hydraulic fracture treatments. Four sites were chosen with cooperating mine owners. Sites where the field work took place were (1) Lucernee No. 6 mine near Homer City, Pennsylvania, (2) Kitt mine near Philippi, West Virginia, (3) Straight Creek mine near Pineville, Kentucky, and (4) Soldier Creek mine near Price, Utah. Industry models were used to design the treatments, and two-dimensional models described were used to analyze the in situ stress effects on fracture propagation. The first wells to be tested and hydraulically fractured were at the Lucerne No. 6 mine. None of the hydraulically driven fractures propagated into the roof rock on this job, and the treating pressure decayed steadily during the treatment, indicating the hydraulic fractures behaved essentially in a two-dimensional manner. The treatment pressures exhibited a similar characteristic at the Straight Creek mine. Fracture containment is predicted at this location because of the in situ stresses.

1808 **(PB—83-232207) Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82.** Rankin, R.L.; Rodgers, S.J.; Polite, E.V. (MSA Research Corp., Evans City, PA (USA)). Nov 1982. 51p. NTIS, PC A04/MF A01.

Field studies were conducted on eight continuous miner sections and two longwall sections operating in five different coal seams. Data and information on dust concentrations and engineering dust controls were acquired for normal operations. Dust concentrations at the mine operator and longwall face locations were evaluated using gravimetric samplers and instantaneous dust monitors. Engineering dust controls that were evaluated included air flowrates and/or velocities, water flowrates and/or pressures, brattice distances and face cutting times or rates. An analysis of the data acquired during the field studies was performed using multiple regression methods.

1809 **(PB—83-233387) Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82.** Walsh, F.M. (ECO, Inc., Cambridge, MA (USA)). Jul 1982. 69p. NTIS, PC A04/MF A01.

The objective of this program was to determine by laboratory experiments the kinetics and mechanics of the reactions that produce acid in coal mine drainage. The program was divided into three phases: In Phase I, five coal mines, representative of Appalachian coal mines, were chosen for sampling and an experimental design was identified suited to accomplish the program objectives. In Phase II, the five mines were sampled and test protocols applied. The results showed most pyrite weathering to be based on oxidation in the presence of water. Iron bacteria, especially Thiobacillus ferrooxidans, catalyzed the rate of pyrite weathering by a factor of three. An increase in initial iron concentration in a system that modeled the mine environment acted to inhibit bacterial catalysis of weathering. In Phase III, five tailings piles were sampled and the material obtained was used to evaluate this method of bacterial catalysis inhibition. The evaluation verified method effectiveness; inhibition of over 80% of the release of weathering products was observed.

1810 **(PB—83-243717) Evaluation of novel coal cutting concepts for reduced dust generation. Open file report 28 Sep 79-7 Jan 81.** Decker, R.W. (Ingersoll-Rand Research, Inc., Princeton, NJ (USA)). Jul 1981. 147p. NTIS, PC A07/MF A01.

This report presents a survey of published novel coal cutting (mining) concepts along with a brief discussion of each. A preliminary evaluation follows that identifies promising concepts, emphasizing reduced dust generation and economic production potentials. The promising concepts are then studied more deeply and evaluated in more detail with recommendations given for further development action.

1811 **(PB—83-250852) Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations.** Jansky, J.H.; Valane, R.F. (Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center). Jul 1983. 28p. NTIS, PC A03/MF A01.

The Mine Safety and Health Administration (MSHA), U.S. Department of Labor, did a linear analysis for a new underground coal mine in Grant County, WV, through the interpretation of LANDSAT imagery and high-altitude, color-infrared aerial pho-

tography, to identify areas of potentially unstable roof in advance of mining. The Bureau of Mines included this mine in its ongoing study of the correlation between geologic features and linears. Three years after the analysis, after mining had progressed through the plotted linears, a cooperative Bureau-MSHA study evaluated the effectiveness of the linear plot in predicting areas of unstable roof and defined the geology associated with the linears.

## 0130 Transport And Handling

*REFER ALSO TO CITATION(S) 1798*

1812 **(PB—83-237354) Demonstrating the noise control of a coal preparation plant. Volume 2: long term treatment evaluation. Open file report Oct 77-Aug 81.** Rubin, M.N. (Bolt, Beranek and Newman, Inc., Cambridge, MA (USA)). Jun 1982. 91p. NTIS, PC A05/MF A01.

The purpose of this work was to obtain operational data on retrofit noise control treatments suitable for use in coal preparation plants. These data were obtained by evaluating the performance of four categories of noise control treatments (resilient screen decks, resilient impact pads, chute liners, and curtains) that were installed in a commercial coal preparation plant. The selection, installation, and initial evaluation of the treatments were presented in volume I of the report. Volume II, the present work, summarizes the results of the long-term evaluation of the original treatments, as well as some additional tests that were conducted on elastomer-clad (resilient) screen decks.

1813 **(PB—83-244038) Development of techniques for obtaining and storing premium coal samples. Annual report 1 Mar-28 Feb 83.** Gunter, M.E. (Southern Illinois Univ., Carbondale (USA). Coal Extraction and Utilization Research Center). Jun 1983. 43p. NTIS, PC A03/MF A01.

This research program is to develop improved procedures for collecting, transporting, processing and storing coal samples to minimize or eliminate sample alteration with time. A rank spectrum of coal samples will be collected, processed and stored under four different sets of conditions. At various times throughout the project, fractions of the stored coals will be tested to detect and/or determine the extent of physical and/or chemical alteration of stored coal samples as a function of time.

1814 **(VTT-TUTK—135) Properties of indigenous fuels. Part 1. Effect of thermal drying on the structure of sod peat.** Nieminen, M.; Ranta, J.; Suominen, E. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Nov 1982. 70p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Effects of factors that are of significance with regard to the thermal drying of sod peat on drying and especially on shrinkage phenomena of sods are discussed. The drying process of sod peat was studied by drying sods in different drying conditions. The drying tests were carried out with the aid of a thermobalance and a heating chamber. Both laboratory-made peat sods and actual sod peat were used as samples. On the basis of the weight change curves obtained, curves of drying rate that are dependent on the moisture content of sods were determined. By comparing these with each other, a conception was obtained about the effect of drying conditions on the drying process of sods. Factors of significance to the shrinkage of sods were primarily studied. The shrinkage of sods was studied on a thermodilatometer and by drying sods in a heating chamber and by measuring their dimensions at certain intervals. In addition, the apparent and true densities of the samples dried in different conditions and certain quantities that describe the structure of wet sod peat were determined. The tests indicated that the drying of sod peat is fairly well in conformity with the general drying mechanism of solid materials. The shrinkage curves proved that small sods (diameter less than 10 mm) shrank remarkably strongly compared to larger sods (diameter about 80 mm). The shrinkage was most intense in the moisture area of 20 - 100 % w/w for dry matter.

## 0140 Combustion

*REFER ALSO TO CITATION(S) 1791, 1810, 2091, 2093*

## 0150 Marketing And Economics

*REFER ALSO TO CITATION(S) 1752*

1815 **(DOE/EIA—0413) Historical overview of US coal exports, 1973-1982.** (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). Nov 1983. 36p. NTIS, PC A03/MF A01 - GPO. Order Number DE84002151.

The majority of US exported coal is bituminous. Two commodity classes, metallurgical and steam, correspond roughly to two major end-use markets. In the seventies, world coal trade consisted primarily of seaborne shipments of metallurgical coal which were affected by the cyclical developments in the steel industry. Between 1973 and 1979, metallurgical coal exports rose from 42.6 million short tons to 50.7 million tons. Sparked by the widening price differential between coal and residual fuel oil, electric utilities and industry began to convert oil-fired facilities to steam coal by 1980. Because of US capability to respond to short run surges in coal demand, steam coal exports rose sharply. The analysis of world coal demand here is centered on the major markets for US coal, Japan, the European Community, and Canada. This analysis discusses the economic and political motives that influence coal import decisions in these markets. Environmental concerns in these import regions are assessed in terms of their impact on government energy policy. (PSB)

1816 **(NE—1983-10) Peat-fired electric power plants.** Hardell, R. (ed.). (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). 1983. 154p. (In Swedish). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751416.

Portions are illegible in microfiche products.

The Swedish resources of peat are of significance for the energy supply in the country. Peat is now successively being taken into use especially for district heating. Considerable parts of the peat resources are, however, located far from densely populated areas. A possible way of utilizing the relatively large quantities of peat in thinly populated areas in Sweden is to build peat-fired condensing power plants that are located in the vicinity of peat bogs. The estimated cost for electric power production in this plant is 292 SEK/MWh. Very large bog areas will be needed for the supply of a power plant with milled peat. The production of milled peat is highly dependent on the weather and, consequently, the requirements on manpower and machines to be engaged during a short season are quite considerable. The possibility of using depth cutting techniques for peat winning needs to be investigated as this may lead to prolonged seasons and lower production costs. The fuel costs in a peat-fired power plant correspond to about 2/3 of the total specific production costs. Different techniques for drying the peat have been reviewed. Combined production of electric power and peat pellets or briquettes is a possiblity that has been discussed several times. The report shows that this proposal is of clear interest if pellets or briquettes are marketable. The feasibility of large peat-fired condensing power plants is to a great extent dependent on the development of effective peat winning techniques. Environmental effects need to be investigated for each location considered. Power production in peat-fired condensing power plants is to a great extent dependent on the development of effective peat winning techniques. Environmental effects need to be investigated for each location considered. Power production in peat-fired plants seems attractive as the major part of the production costs are related to activities within the country.

### 0160 Health And Safety

*REFER ALSO TO CITATION(S) 1793, 1802, 1806, 2454, 3263, 3412*

1817 **(CONF-8110299—1) Heteroatomic polycyclic aromatic hydrocarbons in coal liquids.** Wilson, B.W.; Pelroy, R.A.; Mahlum, D.D.; Frazier, M.E.; Wright, C.W. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1981. Contract AC06-76RL01830. 21p. NTIS, PC A02/MF A01. Order Number DE84000110.

From DOE workshop on analytical chemistry; Paris, France (1 Oct 1981).

The main purpose of this chapter is to review briefly some of what is known about the genetic activity of heteroatomic PAH, and to illustrate how bioassays may be used along with chemical analysis to determine the principle agents responsible for such activity in complex mixtures associated with the processing and utilization of coal-based fossil fuels. The separation and analysis of heterocyclic PAH in complex mixtures, as well as what is known about their behavior in various in vitro tests for genotoxicity are discussed. How chemical and in vitro data from both microbial and mammalian systems may be related to carcinogenesis as determined by long-term animal skin painting or by initiation/promotion assays is discussed. At the present time, the working hypothesis is that the in vitro tests for mutagenicity described are sensitive to events which are probably analogous to the initiation step in the initiation/promotion model for carcinogenesis. Amino-PAH appear to be active at relatively lower molecular weights than do the PAH species in the coal liquids. Concentrations of nitrogen-containing compounds (including APAH) appear to correlate in many cases to the response for most of the in vitro results in these limited studies. The general body of data on chemical carcinogenesis is therefore being looked at to determine if heteroatomic species such as nitrogen containing polyaromatic compounds may be more important in the health and environmental effects of hydrocarbon pollutants than heretofore appreciated. 38 references, 7 figures, 5 tables.

### 0170 Legislation And Regulations

1818 **(AD-A—131805/4) Addition of coal mining regulations to the Computer-Aided Environmental Legislative Data System (CELDS). Final report.** Webster, R.D.; Herrick, E.; Grieme, M.T. (Army Construction Engineering Research Lab., Champaign, IL (USA)). Jul 1983. 29p. NTIS, PC A03/MF A01.

Department of Energy (DOE)-specific regulations on mining have been added to the Computer-Aided Environmental Legislative Data System (CELDS), an online, interactive database developed by the U.S. Army Construction Engineering Research Laboratory (CERL). CELDS indexes and abstracts environmental regulations of the Federal government and the 50 states. Included now are coal mining regulations for the Federal government and those states having Department of Interior approval for their mining programs. The coal mining regulations cover Federal regulatory programs for surface mining and underground mining of coal on Federal, Indian, and private lands. A draft thesaurus of mining terms has been developed. This thesaurus, which will be merged into the existing CELDS thesaurus, will be used to index CELDS records which cover coal mining regulations. The thesaurus terms cover both coal mining technology and environmental impacts of coal mining.

## 02 PETROLEUM

### 0201 Reserves

*REFER ALSO TO CITATION(S) 1905*

1819 **(USGS-PP—1252) Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico.** Drew, L.J.; Schuenemeyer, J.H.; Bawiec, W.J. (Geological Survey, Newark, DE (USA); Delaware Univ., Newark (USA)). 1982. 30p. NTIS, PC A03/MF A01 - GPO. Order Number DE84900264.

A discovery-process model was used to predict, as of January 1, 1977, the expected number and size distribution of oil and gas fields remaining to be discovered in the study area in the Gulf of Mexico and also to forecast the rate at which these fields will be discovered in the future. These predictions and forecasts were done separately for the combined Miocene-Pliocene trend area, which occupies 123,027 $km^2$ of the study area, and the Pleistocene trend area, which occupies 33,612 $km^2$. In both these areas, water depths ranged from 0 to 200 m. As of January 1, 1977, more than 2700 oil and gas fields were still expected to be discovered in both trends. These fields range in size from 0.76 million to 194.3 million barrels of producible oil equivalent. Most of these fields (94.5 percent) are predicted to contain less than 12.14 million BOE (barrels of oil equivalent) each. The rate at which these oil and gas fields will be discovered is forecasted to start at approximately 1.25 million BOE per wildcat well. This rate is forecasted to decline to about half this yield per wildcat well after the drilling of 2600 wildcat wells in the combined Miocene-Pliocene trend area and 1200 wildcat wells in the Pleistocene trend area. Analysis of data from areas where exploration has been relatively unrestricted indicates that the size distribution of oil and gas fields has a log-geometric form. As a result of this analysis, a new procedure was devised to estimate the form of the underlying size distribution of oil and gas fields in areas, such as the study area, where the discovery-data series has been truncated by economic factors. 13 references, 18 figures, 6 tables.

### 0202 Geology And Exploration

*REFER ALSO TO CITATION(S) 1823, 1868, 1871, 3434*

1820 **(DOE/ET/44614—T5) Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116.** Ramondetta, P.J. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1982. Contract AC97-79ET44614;AC97-80ET46615. 43p. NTIS, PC A03/MF A01. Order Number DE84001668.

San Andres oil constitutes more than 80 percent of the total production from the Northern Shelf of the Midland Basin, Texas. The San Andres and Clear Fork carbonate rocks of the Northern Shelf contain sufficient amounts of lipid-rich organic material to rank them as potential petroleum source beds. Organic maturation of these rocks as revealed from vitrinite reflectance and kerogen color, however, is not sufficient to have initiated categenesis. Therefore, oil within Northern Shelf reservoirs was derived mostly from other sources. San Andres oils have a common source, as evidenced by their remarkably uniform composition, which is revealed in liquid and gas chromatography. Wolfcampian basinal clastics and dark argillaceous limestones of the northern Midland Basin are the most likely source rocks for this oil. Vertical expulsion of basinal oil through fractures into overlying shelf and shelf-margin carbonates has occurred along the Lower Permian Abo Reef trend. The trapping mechanism in the Northern Shelf is a combination of structural and facies control. Good reservoir conditions exist in San Andres strata that are draped and subsequently fractured over the subjacent shelf-margin buttress. Late Cretaceous uplift in New Mexico exposed Permian strata, iniating a west-to-east flow of relatively fresh ground water. Passage of this meteoric water through San Andres and Clear Fork reservoirs caused downdip degradation and flushing of the oil. As a result of this ground-water movement, oil/water contacts tilt downdip 0.3° to 0.5°, and oil production is slightly offset downdip from local structural highs. The San Andres and Clear Fork oil was degraded by anaerobic sulfate-reducing bacteria, which resulted in an enrichment of sulfur and light aromatics and a slight depletion of saturated hydrocarbons. This biodegradation progressively increases updip, as evidenced by higher sulfur contents and lower API gravity. 28 figures, 7 tables.

1821 **Attempt to control the frequency spectrum transmitted during the implosion generated by a steam gun in offshore seismics (VAPORCHOC).** Manin, M. pp 3-11 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

For ten years now, the Compagnie Generale de Geophysique has been using on its seismic vessels a source, the actuating fluid of which is superheated steam at 60 bars and 400°C: the VAPORCHOC. Three years ago, a testing centre was set up near Marseilles in order to improve the seismic performances obtainable from this source and, in particular, to provide the clientele with a catalogue of available signals and spectra. Following a brief recapitulation of the principle of the implosion, this paper describes progress achieved in the three fields (which are invariably closely linked in industrial research), of technology, experimentation and theoretical modelling. As regards technology, two new products - the PV 80 fast obturator and the multitrumpet - are now available on the offshore seismics market. As regards experimentation, the testing centre is now provided with enhanced measuring facilities, an undersea camera for filming the evoltion of the bubble, and means for measuring pressures under difficult conditions. In the field of the theoretical understanding of the phenomena involved, two models have been built capable of computer processing, one describing the dynamics of the obturator itself, the other the dynamics of the bubble. 9 figures.

1822 **GIN: integrated navigation and data acquisition system.** Regnaudin, J. pp 12-23 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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This system, built around a minicomputer, enables all the navigation aids possessed by research vessels and offshore work surface supports, namely gyrocompasses, logs, Doppler sonar systems, satellites, inertia platforms and all RDF systems to be recorded and put to immediate use. Guidance along predetermined routes and calculations of optimum routes, together with continuous recording of gravimetric and magnetic data, are all rendered possible with this system. 6 figures.

1823 **SN 348 telemetry system.** Pieuchot, M. pp 24-37 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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New seismic methods call at one and the same time for simultaneous recording of an increasing number of plots, better monitoring of seismographs and their use and improved quality of the transmission of the signals as far as the recorder. The SN 348 telemetry system meets these requirements. The SN 348 was designed and developed by SERCEL with the assistance of the European Economic Community. Extended trials under actual operating conditions have proved that this system is capable of the required performances. With the SN 348, any number of plots up to 500 can be recorded. Monitoring of the equipment and seismographs in situ takes place extremely quickly and is highly comprehensive. The transmission mode entirely eliminates cable noise leading in certain cases to a spectacular improvement in the results. 6 figures.

1824 **Development of a recovery method for Adriatic Sea heavy oil reservoirs.** Lapre, J.F. (Koninklijke/Shell Exploration and Production Lab., Rijsvijk, Netherlands); Pulga, M. pp 489-500 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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To further explore the possibilities of developing the heavy oil of the fractured limestones of Upper Cretaceous-base Tertiary ages of the Adriatic Sea area offshore Pescara, the following tasks were involved: planning the drilling, coring and testing of a well in the Emilio structure and carrying out such operations; analysis of cores from the well (Emilio-4); and laboratory study to initiate the development of a suitable recovery method. The cored section from 3444 to 3450 m depth was found practically tight with a few fractures only, showing stains of very heavy oil. The matrix was found to be water-impregnated. One production test and seven drill-stem tests were performed with disappointing results. The following results were obtained from laboratory studies of cores and fluids: (1) Although Well Emilio-4 was found non-productive, data from this well have been valuable in contributing to the knowledge on Adriatic Sea heavy-oil carbonate reservoirs in general and to the evaluation of Emilio field prospects in particular. (2) The geological analyses have revealed seemingly exceptional oil accumulations, brought about by intrusion of immature heavy oil from a source rock. As a result, the oil has saturated sparsely distributed porous carbonate zones. Furthermore, it has fractured the more abundant tight rock, and from these fractures the oil has to some extent penetrated the tight rock matrix. (3) Although the oil-intrusion model under 2 does not permit the oil distribution to be predicted very accurately with existing petroleum-geological methods, it is most likely that the actual oil-in-place is even less than 25% of the original estimate. (4) The much lower quantities of oil than originally foreseen and the special well completions required to bring the oil to the surface, leave no scope for economic oil recovery. It is therefore recommended that further evaluation work on developing practical oil-recovery Method(s) be discontinued. 9 references, 7 figures.

## 0203 Drilling And Production

*REFER ALSO TO CITATION(S) 1849, 1899*

1825 **(DOE/BC/10316—26) Maximizing steam-drive recovery in light-oil systems. Final report.** Nguyen, H.; Araujo, H.; Roach, P.; Owen, M.; Numbere, D.T.; Crichlow, H.B. (Petroleum Training and Technical Services, Norman, OK (USA)). Sep 1983. Contract AC19-80BC10316. 130p. NTIS, PC A07/MF A01. Order Number DE84001228.

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Petroleum Training and Technical Services has conducted a combined experimental and analytical investigation of the steam recovery of light oil systems. A series of cores ranging in size from 44 cm to 121 cm were used as the experimental core medium. These cylindrical cores were fabricated and set up inside an insulated medium to simulate the overburden and underburden. Superheated Steam was used as the displacing medium. In the analytical study several computer models were developed by integrating existing software concepts to provide analytical tools for examining the response of intermittent injection and continuous drive mechanisms. 49 figures, 5 tables.

1826 **(DOE/ET/10612—T1) Enhanced oil recovery: a strategy for improving domestic production.** (Lewin and Associates, Inc., Washington, DC (USA)). Spr 1980. Contract AC01-77ET10612. 57p. NTIS, PC A04/MF A01. Order Number DE84002251.

This document discusses a new strategy for enhanced oil recovery R and D. Until recently, our R and D strategy was to put in place a set of targeted cost-shared field experiments with industry. The idea was that industry, using its own funds, would expand the successful tests to field-wide production. Implementation of the ERA incentives for EOR production in August 1979 has necessitated a change in this R and D strategy. We now have 23 cost-shared field projects underway, and more than 60 applications for field pilots have been received by ERA. Taken together, these activities constitute a formidible laboratory of field experiments, although certain high potential targets still are not being addressed. In brief, the new strategy is to leverage roughly $2 billion worth of investment, using a relatively modest level of R and D funding. The objective is to translate EOR technology from a black art to science by the mid-1980's. By doing this, the advanced EOR processes will move into consideration for commercial investment. This new strategy is in sharp contrast to the old one which essentially involved putting a group of field projects in place; this job has now been largely accomplished through the cost-shared projects and the ERA incentive activity. The first part of this document provides a brief overview of the domestic potential of EOR. It is followed by a comparison of predicted versus actual performance for several

cost-shared field tests. Next, several charts are presented which depict the industrial decision using process and the potential impact of advanced technology. Finally, a new Federal EOR R and D strategy is discussed including an assessment of public benefits.

1827 **(NUREG/CR—3467) Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report.** Ng, Y.C.; Cederwall, R.T.; Anspaugh, L.R. (Lawrence Livermore National Lab., CA (USA)). 30 Jun 1983. Contract W-7405-ENG-48. 101p. (UCRL—53485). NTIS, PC A06/MF A01; - GPO. Order Number DE84002464.

An environmental assessment of the use of radioisotopes as interwell tracers in field flooding for the enhanced recovery of oil and natural gas was performed. A typical operation using radioisotopes for interwell tracing was analyzed from the standpoint of three stages of operation: aboveground, subsurface, and recovery and disposal. Doses to workers who handle radioactive tracers and to members of the public were estimated for normal and accidental exposure scenarios. On the basis of estimates of the total quantity of tracer radionuclides injected in a year, the annual number of projects, the average number of injections per project, and assumed values of accident frequency, the collective dose equivalent is estimated to be 1.1 man-rem/y to workers and 15 man-rem/y to members of the public. The national radiological impact of the use of radioisotopes as interwell tracers in EOR projects is estimated to be a total collective dose equivalent of $<16$ man-rem/y. Accidental exposures are estimated to contribute relatively little to the total. 47 references, 8 figures, 43 tables.

1828 **(SAND—83-7120) State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report.** (Earth Technology Corp., Houston, TX (USA)). Aug 1983. Contract AC04-76DP00789. 158p. NTIS, PC A08/MF A01. Order Number DE84002891.

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As offshore oil and gas development have moved into deeper waters, conventional, fixed, bottom-supported platforms have become less attractive economically. The Tension Leg Platform (TLP), or Vertically Moored Platform (VMP), a buoyant, compliant, drilling and production platform for deep water sites, is one of the new platform concepts that has evolved. The unique foundation loading characteristics and applicable water depth for deployment of TLPs are placing new demands on offshore foundation engineers. The behavior of foundations subjected to a sustained uplift (tension) load with large cyclic loads superimposed is not well understood. TLPs will require that methods for performing site investigations and in situ testing and methods for installing foundations be developed for deep water areas. This report is a state-of-the-art review of the technology required to reliably design and construct TLP foundations in deep water. It evaluates the key aspects of the TLP schemes proposed by various designers, and documents past and current experimental work (laboratory, model, and prototype) relevant to the behavior of TLPs. The Earth Technology Corporation has identified those geotechnical aspects at TLP facilities in which data, theories, techniques, and equipment are currently insufficient. These include site investigations, soil property determination, foundation behavior, and facility installation and operation. Finally, the report identifies critical areas in which additional research and development work is needed. 203 references, 22 figures, 16 tables.

1829 **New technologies for exploration and exploitation of oil and gas resources. Volume 1.** London, England; Graham & Trotman Ltd. (1979). 726p. (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)). Graham & Trotman Ltd., Bond Street House, 14 Clifford Street, London, W1X 1Rd, England.

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Volume I contains 48 papers covering the following topics: geophysics; drilling; offshore platforms; production operations; pipelines; enhanced recovery; liquefied natural gas transport; submersibles/diving; underwater storage; and safety. All papers have been abstracted and indexed for the Energy Data Base. (ATT)

1830 **Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system).** Nard, G. (Societe d'Etudes Recherches et Constructions Electroniques, Nantes, France). pp 38-53 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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Since 1974, off-shore prospection and exploitation have been using the SYLEDIS radiolocating system more and more often (SYLEDIS: French acronym indicating Lightweight System for Range Measurement). This system, which results to correlation techniques and time measurement of UHF waves, is now well known for its accuracy (a few metres) and range (100 to 200 km). Over 50 systems are used intensively in 25 countries on the 5 continents. The recent increase in prospection activities on the continental shelves up to distances of 300 to 400 km has made extension of the range of the system desirable. The MEROPS project consists in developing all the additional facilities of the SYLEDIS needed to ensure such ranges in all weather and all climates. The additional facilities developed and implemented involved: the nature and configuration of the shore station antennae; the power of the transmitters and the sensitivity of the receivers, filtering out of all components not essential to the signal spectrum, reduction of the effects of the anomalies and beyond-the-horizon propagation of the waves (fading and abnormal refractions), and by means of appropriate processing equipment. 9 figures.

1831 **Deep sea drilling: extension of the dynamic positioning capacity by means of the long base.** Vandoorne, B.; Renard, B.; Dorel, M. pp 69-85 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The Long Base acoustic deviation measurement system has been developed for drilling vessels as replacement for the taught wire system that is not accurate enough in very deep water. In addition, this system could find applications in the case of the development of off-shore oil fields, since it makes it possible to work with dynamic positioning at any point on the surface covered by the beacons. It is based on the measurement of the lapse of time between interrogations emanating from an acoustic transducer installed beneath the hull of the vessel and the reception of the responses from three beacons laid on the sea bottom forming a large dimensioned triangle. Following partial trials on the TEREBEL and compatibility tests under continuous operating conditions between the Long Base and Short Base, specifications were drawn up in December 1976 and THOMSON-CSF built a prototype which was installed aboard the drilling vessel PETREL. Tests in a Mediterranean in October 1977 concerned the performances hoped for and led to a few modifications to eliminate some of the equipment defects. 5 figures.

1832 **Remote-control of a blowout preventer and instrumented pup-joint of a riser.** Dorel, M.; Gosselin, J.C.; Renard, B. pp 86-104 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A particularly important installation for deep off-shore drilling is the blowout preventer (BOP). The basic purpose prevailing in the design of the system as a whole is to make it possible whatever the circumstances to close down the well in all safety and to protect the surface device after the riser has been connected. The two monitoring and control systems, entirely independent and redundant, make it possible to carry out all nominal functions. Each is equipped with automatic sequential performance of the functions of closing down the well and disconnecting the riser within 12 to 26 seconds. In the case of total loss of the transmitting and connecting cables, a standby system can be used that operates by means of

acoustic transmision, known as the TELTAC. A new major safety factor is now in the development stage: the instrumented pup-joint at the bottom of the riser, the function of which is fast detection of blow-outs, together with optimization of the riser service conditions. Located just above the lower articulation of the riser, this pup-joint comprises stress, pressure, temperature, inclinometry, gas detection and tool-joint detection sensors. Detection of inflows at this level is highly important. It makes it possible to decide whether to close down the well before the riser is flooded and hence to deal with the inflow safely. The operating conditions of the riser depend on the tension applied at the head. The measurements provided by the pup-joint enable this tension to be adjusted and hence risk of rupture to be reduced. Within the framework of the deep-sea drilling project, an instrumented pup-joint has been developed in collaboration with MATRA. By recording the parameters measured, it is also possible to gain a better understanding of the average conditions of use of the riser. 9 figures.

1833 **Operation of the special equipment installed on the dynamic stationing vessel Petrel.** Vasseur, B. pp 105-118 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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For over two and one-half years, the Petrel has been active since commissioning, working in operating conditions that have generally been difficult. These conditions have made it possible to assess the efficiency and safety of the dynamic stationing system. Functional and operational results are presented in consolidated or statistic form. The vessel has been used for testing new reference systems capable of extending the use of this type of unit. The circumstances of the tasks carried out have resulted in considerable stressing of the riser and its associated equipment. Results are given. A number of re-entries and reconnections were made. They took place as expected. The diving system was used only little during operations. However, the Janus IV (Comex French Navy) experiments were carried out, increasing the world diving record to 501 metres. During observation and intervention, the diving turret carried out its program perfectly. The extensions and innovations made to the drilling equipment, together with the restructuration of the drilling zone in the center of the vessel, concerning in particular handling of the BOP stack, turned out to be well adapted to operational requirements. Monitoring of the BOP stack by a multiplex prototype system operated well. Paradoxically, the conventional hydraulic equipment gave rise to some concern. 3 figures.

1834 **Ben Ocean Lancer: a successful development programme for deepwater drilling.** Tolson, J. pp 119-133 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The movement of offshore drilling into greater water depths necessitates the availability of deepwater rigs developed to provide a stable platform and proved systems to allow drilling to be quickly and competently carried out. The geographic spread of deepwater areas throughout the world and their frequently hostile weather environment demands a rig of greatest mobility and good weather keeping characteristics. In 1974 Ben-Odeco Ltd., of Edinburgh placed an order for a dynamically positioned drillship to drill in water depths up to 3000 feet (915 metres) to fulfill this requirement. Ben-Odeco Ltd., aware that earlier rigs had had difficulties in providing full reliability at greater water depths, instituted a programme of Research and Development into the systems necessary to provide such reliability. This research was supported by the Directorate-General for Energy of the Commisson of the European Communities and has contributed directly to the outstanding performance of the drillship during its first 18 months in service. During that time a range of successful deepwater wells have been drilled in frequently severe operating conditions. The value of research and of the training and technical competence of the men that crew the drillship has been proved in operation and BEN OCEAN LANCER has deservedly established a reputation as an outstandingly competent rig. 1 table.

1835 **Feasibility study on a submerged wave dampener.** Facon, P. pp 137-146 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The purpose of this feasibility study is to evaluate the performances and possibilities of application of a submerged wave dampener. The dampener consists of two caissons equipped with flexible valves opening one way, either inwards or outwards, so as to establish water circulation between one caisson and another, dissipating the energy by turbulence. Tank tests on a model have shown that one can achieve an attenuation of over 60%. The submerged position brings two advantages: no hindrance to navigation and better behaviour during storms. Work is now going on with a view to reducing manufacturing costs. 4 figures.

1836 **BP development of tethered buoyant platform production system.** Lang, J.R.A.; Hedley, C.J. pp 147-159 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The Paper describes BP's work since 1975 to develop a Tethered Buoyant Platform Production System for use in water depths from 100 to 600 metres. The work so far completed is part of a four phase programme of which the final phase would be the design and specification for tendering purposes of a prototype system. So far the first two phases have been completed and the initial part of the third phase is well advanced. Phases 1 and 2 included the preliminary development of a system so as to confirm essential feasibility, optimization of key items such as platform configuration and basic riser concept, and the establishment of an outline design for major components. The essential design techniques required for system engineering have also been identified. The present work of the third phase is carrying this development forward to establish the best practical details of key components such as tethers, risers and associated hardware, etc. The Paper describes the major work in each phase to date, illustrates the design techniques available and discusses the immediate water depth range of such a system. 7 figures.

1837 **Design of two storage and loading floating platforms.** Falcimaigne, J.; Ombret, R.; Lanquetin, B. pp 160-179 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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Two large capacity (130,000 $m^3$) floating storage platforms were designed. One is in steel, the other in concrete. First, the guiding principles of the design of each solution are presented, followed by a concise description of the studies carried out to verify the behavior of the platforms. In this phase, an attempt has been made to predict and analyze the phenomena that may occur with this design. Lastly, the final section sets forth the procedure enabling the final dimensions of the platforms to be selected, giving the main results of a comparison between several geometrical configurations. 3 references, 3 figures, 3 tables.

1838 **Permanently located offshore structures the development of steel offshore jackets.** Cornuel, P. (ETPM, Paris, France); Dallas, M.; Delaporte, P.; Lamb, R.S.; Lappin, J.P.; Wootton, L.R. pp 180-204 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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This report is the result of an extensive study carried out from 1974 to 1977 into the development of offshore structures. The

work summarized here is concerned with methods of improving the design and construction of steel jackets. 8 figures, 3 tables.

1839 **Application of a concrete articulated buoyant column to offshore drilling and production systems.** Smith, J.R. (Taylor Woodrow Construction Ltd., Southall, England). pp 205-220 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Market trends are generating increasing pressure to develop total cost effective systems for the exploitation of less amenable hydrocarbon resources offshore in existing and deeper waters. Since early 1977, Taylor Woodrow Construction have been engaged in an extensive research and development programme into such a system, based upon a concrete articulating buoyant column. This work is being undertaken with the financial support of the EEC and the technical advice and guidance of a number of major American oil companies. Following an outline description of the concept, the paper highlights some of the important aspects of the development, including analytical, hydraulic and material studies. Strong emphasis is placed on the practicalities of construction, installation and operation of systems which can provide full drilling and production capabilities down to depths of at least 400 metres. Wide applications, including early production systems, are foreseen, and cost effectiveness is demonstrated by economic analysis of typical fields. 11 figures.

1840 **Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas.** Finsterwalder, K. (Dyckerhoff and Widmann AG, Munich, Germany). pp 221-230 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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An international syndicate known as COSMAR is currently engaged in a research project aimed at acquiring the knowledge needed for the designing and utilization of floating concrete structures for the production, storage, and carriage of liquid hydrocarbons in offshore areas. The project takes account of such extreme environmental conditions as are to be found at great depths in the sea and in the Arctic and the effect which storing hydrocarbons at temperatures of as low as minus 200°C may have on concrete and steel components and on the structure as a whole. Its aim is to design concrete structures for use under such conditions which - by carefully selecting materials and developing suitable types of concrete, types of construction and methods of calculation - will be given those properties of safety and durability which are a matter of course on land. The project is divised into four subprojects: (1) static strength tests; (2) fatigue strength tests; (3) development of concrete designs and the effects of temperature on them; and (4) offshore concrete structures amid ice and under Arctic conditions. The total project will cover a period of three years and is in the hands of a consortium of German and Norweigian firms headed by Dyckerhoff & Widmann AG. The capital involved is DM 8 million. 2 figures.

1841 **Deep sea productions: construction and operation of a pump down tools testing station in a production well.** Soulie, G. pp 263-279 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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Workover of undersea production cells calls for operations inside the production tubing, Christmas tree or flowline. Whereas on land or on a platform workover in the production tubing involves only light equipment for the work by wire-line, the implementation of this method for undersea wells calls for the use of an expensive floating support dependent on the sea and weather conditions. To free oneself from this support and in order to carry out this well workover remotely, at once and in all weather, the TFL (Through Flow-Line) method has been proposed. In this method, the tools equipping the production tubing are sent to the well, locked-on or pulled-out by pumping in the flowline, from the emergent platform. Before choosing this new method for the development of undersea deposits, it was indispensable to make tests to check their validity, appraise their possibilities or possibly improve the facilities and methods applied. Thanks to the authorization of the SNEA (P) placing a flow well at our disposal, we were able to design and build a testing station for pump down tools. A surface circuit equipped with a simulating line and appropriate well equipment rendered gradually possible all the workover operations on a well and will be adaptable to testing new equipment or methods. 4 figures.

1842 **North-East Grondin experimental station.** Duvet, C. pp 294-318 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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As early as 1974, SNEA(P) started on the design and construction of the NORTH-EAST GRONDIN STATION - an offshore production experimental station, the purpose being to develop and try out the methods and facilities for harnessing hydrocarbon deposits in depths of water ranging from 600 to 1000 metres. The station was installed in 1976 on the Grondin oilfield, in the Gabon, 40 km from the coast in a depth of 60 metres. It essentially consists of: the undersea installations - foundaton plate, wellheads, remote-controls and links to the platform; the surface installations on a fixed platform and servicing base ashore; and the floating equipment: the barge Anguille, carrying all the operating facilities. The first well was drilled in 1976, and two other wells were sunk and went over to production in the following two years. By the end of 1978, the station was producing from 2 wells operating by hydraulic remote-control system, and new remote-control equipment had reached the final testing stages in France. The station has already yielded significant results. For example: drilling and completion of wells at high skew angles, from floating drilling supports; drilling and connection of undersea structures without requiring the intervention of divers; and operation of undersea wells by wire-line and gas-lift. An additional experimental program is to take place, directed in particular towards rendezvous techniques, wire-line servicing operations inside wells and work on undersea structures (remote-handling by submarines and robots). 5 figures.

1843 **Undersea excavation test for the protection of submerged equipment in the arctic seas.** Duval, J.; Mercier, G.; Morin, P. pp 319-335 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

In order to protect undersea petroleum installations (Christmas trees, manifolds) from icebergs scouring the sea bottom, studies have been undertaken as part of the Arctic Seas Production project and have resulted in the choice of housing each installation inside an excavation made as follows: a cable-pulled drag travels along a bearing cable, excavating at one point and discharging the cuttings at another point about 100 metres away. This system, which resembles an undersea ropeway is adapted to morain-type soils (boulders + gravel + sand). The purpose of the test carried out in July-August 1978 was to provide proof at almost full scale that the method selected was viable and could quickly become operational. After making the system operational in the North Sea in medium depth, the motor vessel DUPLUS carried out full-scale trials off Brittany in a depth of 150 m of water, and the system operated correctly for 30 hours. It was seen to justify the hopes invested in it and the procedures quickly became routine. Twenty hours of routine work are enough to move about 1000 $m^3$ of material in 100 grab fills. The conclusion is that the method tested is sound and well-adapted to the problem. If necessary, it could be implemented operationally within a relatively short time (2 years). 9 figures.

1844 **Improvements to gas detection systems.** Denney, Dorset, E.J. (J and S Sieger Ltd., Poole, Dorset, England). pp 336-344 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The use of catalytic gas detectors for the protecton of oil and gas production platforms against explosion hazards is discussed. These detectors can be poisoned by contaminants present in hostile industrial environments and the only available method of preventing this is by means of carbon cloth filters. These impose other limitations on the detector performance. This project is studying the mechanisms of poisoning of the catalysts used in detectors by means of surface analysis methods, to assist in identifying the most common ways in which inhibition occurs, and to improve gas detectors by the use of catalyst formulations resistant to poisoning. 3 figures.

1845 **Automated underwater wellhead.** Banzoli, V. pp 360-372 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A new underwater wellhead remote control system has been designed, built and tested (both at the workshop and at sea) by TECNOMARE S.p.A. The main components of the system are a surface control consolle and an underwater control module (composed of an electro-hydraulic plant, an electronic unit and an hydraulic-electronics electrical interface). The underwater electronic unit can be connected to the surface control module by means of three different transmission links: acoustic signals propagation through the sea water, electrical multiplex cable and via flowlines. The control signals are transmitted, after a suitable codification, from the surface control consolle to the underwater electronics, using one of the three transmission links. The signals, after decodification, are sent, through the electrical interface, to the hydraulic plant which operates the wellhead valves. In addition to the control of the wellhead valves, the system can also provide the operator with the date necessary to know the wellhead situation: valves position, pressure values, battery voltage, etc. The control system has been designed for a water depth of 600 m and a distance between wellhead and surface terminal of 8000 m. Shop tests have been carried out, up to July 1978, in order to verify the system performances and the reliability of the adopted technical solutions. The tests have proved that all the components of the system meet the project specification: the performances of the electronics (surface and underwater), electrical interface, electrical battery, hydraulic unit were very satisfactory. In order to verify the performance of the acoustic transmission system, sea trials have been carried out in 1975 with a laboratory prototype. Sea trials of the complete system have been carried out in July-August 1978 in Jonian Sea (in 70 m water depth) with very satisfactory results. 8 figures.

1846 **Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy.** Chierici, G.L.; Dalla Casa, G.; Terzi, L. pp 501-518 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Since 1957 Gela Field, Italy, has produced very heavy and viscous oil from a reservoir at a depth of 3200 to 3500 meters. The reservoir oil is undersaturated and shows both an areal and vertical variation of its characteristics. The reservoir geometry is complicated because of the presence of a system of faults and the variation of the degree of fissuring throughout the field. Production mechanism is by water drive; the reservoir is rate-sensitive and the oil production rate is kept at a level low enough to prevent water production problems. The purpose of the research was to find out whether oil recovery can be enhanced by replacing the natural water drive mechanism with the injection of either natural gas or carbon dioxide. Laboratory tests have been performed on cores to assess how gas drainage improves oil recovery in comparison with water imbibition, and how injected gas affects the thermodynamic characteristics of reservoir oil. A three-dimensional, black oil numerical model has been employed to evaluate the improvement in oil recovery and oil production rate that can be achieved under different gas injection schemes. The model had been previously validated by matching field past history; the future field performance by natural water drive has also been evaluated, to provide a basis for comparison. 5 references, 10 figures.

1847 **Treatment fluids to improve sea water injection.** Davison, P.; Grist, D.M.; Hyatt, J.P.; Gardiner, D.C. pp 519-534 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A micellar fluid has been developed for stimulating sea water injection wells which are limited in capacity by residual oil in the critical flow zone around the well. In initial laboratory work, much effort was devoted to establishing the basic mechanism of oil displacement by micellar fluids in porous media. In particular the physical properties controlling residual crude oil displacement from pores were established. Sand bed tests with various geometries and core tests were carried out, the latter under reservoir conditions. These demonstrate the effectiveness of the micellar fluid for raising effective permeability to sea water at temperatures up to 100°C. Methods of predicting the effect of an injected microemulsion slug on injection well performance are presented. The injectivity of a Forties Field sea water injection well has been raised by treatment with this micellar fluid. The quantity of fluid required for field trial was blended, shipped and injected without difficulty. Results appear promising. The well performance continues to be monitored. A brief description is also presented of concurrent research on sea water soluble thermally precipitable polymers for in-depth vertical flood profile correction. 11 references, 3 figures, 3 tables.

1848 **Enhanced recovery in heavy crude and bitumen deposits.** Burger, J.G. pp 535-552 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The exploitation of heavy crude deposits calls for the use of specific methods, since conventional methods lead to low recovery rates from these types of oil field, and certain techniques are hardly promising owing to the low mobility of the oil in place. Thermal recovery methods developed during recent years, in situ combustion and injection of hot fluids, lend themselves well to the exploitation of mobile heavy crude deposits, the viscosity of which, under the conditions prevailing in the deposit, lies at from about one to a few tens of poises. The characteristics of thermal methods are presented and discussed. In particular, the extension of steam zones and hot water zones during displacement by steam is determined, with an indication of the energy efficiency of thermal methods. A full scale production project for a shallow deposit of heavy crude by means of in situ combustion is briefly described. On the other hand, at present, no appropriate technology is available for exploiting very heavy deposits of oil and bitumen. Now, very considerable reserves of oil are contained in such deposits. In order to harness these resources, consideration may be given to combining thermal effects with the action of liquid organic solvents. Laboratory studies are needed to develop this type of method. 13 references, 4 figures, 2 tables.

1849 **Development of methods for production of tar-oil in the Federal Republic of Germany.** Hofmann, H.J. pp 553-565 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

In Germany, some reservoirs of heavy oil or tar-oil are known. Up to now there is no possibility to produce these reservoirs economically. The biggest of these deposits seems to be the Nordhorn Oilfield in the northwestern part of Germany. The reservoir was discovered in 1942 and 20 wells were drilled till 1945 without showing any oil flow into the boreholes. For clarifying the geological conditions and the oil in place more exactly and for obtaining representive rock and fluid samples it was decided to drill 5 additional wells in 1975. In each well the entire reservoir was cored to estimate petrophysical and oil properties. Because of the extremely high oil viscosity of about 1,000,000 cP at reservoir conditions, thermal methods seemed to be the most suitable recovery technique. Hot water and steam flood lab-tests resulted in recovery up to 45% of oil in place. In one well a steam injection test was performed. Total steam injection amounted to 1000 t with rates of 3 to 3,3 t/h. During the following production test about 55 t of crude oil were produced within 2 weeks. A main problem influencing the economics of this field is the low price of the crude oil. Analysis of oil samples by two refineries showed that it has no low-boiling components and is not suitable for lube oil, asphalt or also extra heavy fuel. Further investigations concerning the possibility of utilization are underway. 1 reference, 7 figures, 2 tables.

1850 **Subproject 1: deep diving diverlockout, dry transfer and rescue submersible family.** Haas, J. pp 601-608 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Manned submersibles have progressively succeeded in many underwater tasks in the last few years. While the subs of the first generation, designed for non-specific purposes, had to be adapted to suit practical requirements, the development of 2nd-generation submersibles took at least some in-field requirements into account. Today several years of operational experience serve to back up the design of work submersibles of the third generation. The development of the Bruker Mermaid VI type submersible fully takes such requirements into account: greater operational depth; more payload and energy capacity; improved maneuverability and control systems; and long-time work capacity for locked out divers. Three main modifications are derived from a basic concept and form a submersible family: a diverlockout, a dry transfer, and a rescue vehicle. Due to market requirements, a convertible diverlockout/rescue submersible model is now actually under construction with top priority. The first prototype will be launched in summer 1979. 2 figures.

1851 **Subproject 2: an autonomous, manned, submersible catamaran equipment carrier - the Bruker Subcat.** Haux, G. pp 609-616 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Underwater work in the North Sea is very dependent on weather conditions at the water surface; in rough winter months, practically all offshore work simply comes to a standstill. The goal of the project described here was to develop an autonomous manned submersible construction for heavy-duty underwater construction and maintenance work, as independent as possible from both surface conditions and surface support. Intensive study of the most important underwater jobs has shown that the proposed submersible catamaran design has enormous advantages compared to other conventional configurations. Particularly for handling small work subs, working on pipelines, aiding in all phases of underwater construction as well as for diver support, the twin-hulled Subcat with its portal connections has far superior possibilities than any present alternatives or proposals. The technical description presented here elucidates the Subcat design and its equipment with respect to specific underwater job problems and practical application possibilities.

## 0206 Health And Safety

*REFER ALSO TO CITATION(S) 1821, 1823, 1838, 1854, 2454*

1852 **(NP—3751465) Feasibility of leak detection in process plant on offshore installations.** (Oljedirektoratet, Stavanger (Norway)). Feb 1981. 58p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751465.

Portions are illegible in microfiche products; A joint feasibility study carried out by NTH-SINTEF, Trondheim (Norway) and Unit Inspection Company, Swansea Wales (UK).

The objective of this work was to investigate the use of acoustic methods of leak detection for application on process systems and pipework offshore. Existing gas leak detection systems, based on catalytic bead detectors (pellistors) do not give adequate warning of a potentially explosive atmosphere close to source, therefore a more direct method of detecting a leak is needed. Acoustic leak detection is the most promising method for the continuous monitoring of leaks and will give information on leak size and position. The noise that is generated by a leak is caused by turbulent flow within the leak channel and this increases with increasing leak rate. Theoretical relationships are given relating onset of turbulent flow to sound energy generated by leaks, which give good agreement with experimental results. It has been concluded that acoustic methods of leak detection show considerable promise in providing continous leak monitoring, but further research is necessary to determine optimum operating frequency with regard to leak noise, background noise and attentuation. The best means of data processing and presentation will require evaluation. 22 drawings, 2 tables.

1853 **Mines Safety and Health Commission for the mining and other extractive industries. Its role in oil and gas exploration and extraction.** Leclercq, J. pp 665-678 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The speech traces the history of this organization, which was set up in 1957 following the Marcinelle mining disaster in Belgium when 262 lives were lost. The Government Representatives have given the Mines Safety and Health Commission (MSHC) special terms of reference which enable it to act quickly and directly on the prevention of accidents and damage to the health of workers in coal mines. Instead of making proposals for Directives or Recommendations to the Council of Ministers of the Community it addresses proposals directly to the governments and ascertains what action is taken on them. In consists of representatives of the governments, the employers and the workers. In 1974 its terms of reference were extended to cover all the extractive industries. The speech describes how the MSHC functions, with the help of twenty working parties and committees of experts, and reviews its work over the past twenty years in the coal mining sector. There is a brief summary of its exchanges of information and safety campaigns. Its experience in these matters helps the MSHC in its work in the other extractive industries, particularly in the projects initiated in 1977 on oil and gas blowout prevention, since this kind of incident could lead to a serious collective accident. The MSHC also works in collaboration with the Conference on Safety and Pollution Safeguards in the Development of North-West European Offshore Mineral Resources and the European Diving Technology Committee. The MSHC has tried to keep very up-to-date with technical advances, and even to be in the forefront, making maximum use of the lessons to be learned from disasters. The Commission's experts are attending this Symposium to further these aims.

1854 **Project safety reviews: an aid to management.** Allen, C. pp 693-703 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

However well intentioned enlightened Managements profess to be, in relation to their employees and plant, there is always a need to stand back and look at one's workplace, work methods, designs and procedures. The need is seen clearly in financial control and auditing so why not in safety matters. A number of major oil, chemical and other high risk industries have recognized the need to review, audit and monitor new plant, modifications or additions to plant, starting at the conceptual stage, through to the design and pre-commissioning phases. This need consists of checking the plant location for impact on: the public; the employees; and the environment. There is a need to check designs for errors and omissions and to detect hazards concerned with the interaction of a number of functions. These hazards are likely to arise from the unexpected interaction of seemingly safe components, or methods of operation under exceptional conditions. The knowledge gained can be used to anticipate whether the plant will operate as intended under all possible conditions. The method used by my Company is to review the: project concept; detailed design; pre-commissioning safety audit; and post commissioning and follow-up safety audits. A report is issued on completion of each stage but additionally the Project Manager and the clients attention is drawn to items uncovered by the review or audit team which requires an immediate decision, if the project is not the be subject to delay or changes. In addition to the use of this technique on new projects it is also used in the assessment of major modifications as an integral part of my Company's modification procedure.

1855 **Safety of installations for work at sea.** Planeix, J.M. pp 716-731 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Industrial development must be matched with an increased safety, as the variety and the power of man's machines become larger, even if their number can be limited to accommodate desired patterns of growth. This is true for the young field of endeavour of work at sea even more than for the traditional, millenary old, trading of ships at sea. When considering safety, it is important not to dissociate the capability of a structure to resist applied loads from the effect of human action on the application and the intensity of the loads. Operational and structural aspects of safety have to be considred for the practical, down to earth, evaluation of safety as well as for the more refined - and at present futuristic - risk analysis. Classification Societies, acting on their own, i.e., on the basis of their own Rules and Regulations, or as Certifying Authorities applying national or international regulations, play an active role in insuring safety for units employed in prospecting for and exploiting oil and gas resources at sea and, even if more generally in the sense of technical assistance, for units performing other tasks of work at sea. This role covers a complete review of the design, the check of drawings, the control of materials and the survey of construction, up to hook-up and commissioning.

## 0207 Marketing And Economics

*REFER ALSO TO CITATION(S) 2530*

1856 **(DOE/EI/19624—T1) State Heating Oil Grants Program. Final report, September 1, 1982-May 31, 1983.** (New Hampshire Governor's Council on Energy, Concord (USA)). 1983. Contract FG01-82EI19624. 8p. NTIS, PC A02/MF A01. Order Number DE84001087.

Portions are illegible in microfiche products.

The price of number two fuel oil have ranged widely through this eight month period. The price rose from October to November, 1982 but then began a long slide which bottomed out in April 1983. The average wholesale price fell by more than 24% from a high of 105.63 cents per gallon to a low of 103 cents, a decline of more than 17%. The margin between the wholesale and the retail price climbed from 18 cents in October to a high of 26.71 cents per gallon in February before falling to the periods lowest point of 17.9 cents in May. There was a sharp increase in the wholesale price in April (8.5 cents or more than 10%) and a smaller increase in the retail price during that same month (3.8 cents or 3.6%). Stocks fell sharply from January through May with an increase shown only in April. With only a limited sample to work from it is difficult to access the accuracy of the figures but the average stock levels were 53763 gallons in January, dropped to 32704 in March before rebounding to 41717 in April. The slide continued to May when the average stock had fallen to 27180 gallons per dealer. Reliable figures are available from only 21 dealers.

## 0208 Waste Management

1857 **(PB—83-247148) Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82.** Brown, K.W.; Deuel, L.E. Jr.; Thomas, J.C. (Texas Agricultural Experiment Station, College Station (USA)). Aug 1983. 206p. NTIS, PC A10/MF A01.

The land disposal of API separator sludges was investigated with regard to decomposition rates or organic constitutents and the possible impact of these materials on plants and surface water or groundwater quality. Two oily sludges (one from a petroleum refinery and one from a petrochemical plant) were studied as to their phytotoxicity, biodegradability in soils, water-soluble constituents, and field mobility. The water-soluble compounds in both sludges were low indegradability, potentially toxic, and extremely mobile in high concentrations. These results indicate a need for careful managmement of land treatment sites to avoid groundwater contamination. Gas-liquid chromatography (GLC) combined with column chromatography is recommended for effective monitoring of oily wastes applied to soils.

1858 **(VTT-TIED—221) Re-refining of industrial spent oils.** Piirilae, E. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 42p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Hydraulic, turbine and circulation lubricants of industry form about a third of the quantity of spent oils collected in Finland yearly. These spent oils are formed in fairly large lots, and hence they are cheap to collect. The proportion of additives and impurities is typically fairly small compared, for example, to that in spent motor oils. In the literature review, the character and addtivies of the base oil of industrial oils, their ageing and the most usual re-refining methods are discussed. In the experimental part of the report, the contamination stage of typical industrial spent oils is dealt with. Tests with the removal of water and solid impurities were carried out at two plants that operate on an industrial scale. Properties of activated and unactivated bleaching earth in the finish of oils were studied with the aid of laboratory tests. As a conclusion, a calculation of re-refining costs is presented.

## 0209 Environmental Aspects

*REFER ALSO TO CITATION(S) 1821, 3271*

1859 **(AD-A—131522/5) Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82.** Berry, D.A.; Holdren, M.W.; Lyon, T.F.; Riggin, R.M.; Spicer, C.W. (Battelle Columbus Labs., OH (USA)). Jun 1983. 83p. NTIS, PC A05/MF A01.

The environmental impact of organic compounds emitted from jet aircraft turbine engines has not been firmly established, due to the lack of data regarding the emission rates and identities of the compounds. The objective was to identify and quantify the organic compounds present in gaseous emissions from jet engines and to study the photochemical behavior of these compounds. This interim report describes the experimental work performed for Task 1 (sampling and analysis method validation) and Task 2 (combustor rig testing), wherein a variety of sensitive and reliable methods were developed and evaluated for the determination of the wide range of compounds likely to be emitted from jet engines. Tasks 3-5 will be performed between April and September, 1983. At that time emissions from full-scale jet engines be chracterized in terms of chemical composition and photochemical reactivity using a variety of fuels and operating conditions.

1860 **Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons.** Barbier, Y. pp 679-692 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The various phases of exploration and exploitation of hydrocarbons, possible causes of nuisance and pollution in these phases and their prevention are presented. Exploration: recent seismic wave generators are not dangerous to fauna. During exploratory drilling, the main risk is that of blowout. The arrangements to protect wells during drilling and procedures for keeping wells under control are described. Information is given on the major causes of pollution during drilling together with the relevant preventive measures. Exploitation: drilling of production wells involves less risk than that of exploration wells. The same arrangements are made for both. During exploitation, servicing of wells is necessary from time to time, and this is where the major risk of blowout occurs. The safety equipment of productive wells and servicing procedures are described. Production platforms are equipped with automated operating systems embodying an independent safety device. The remaining causes of pollution and their remedies are enumerated. The results obtained by these facilities are described. 2 figures.

## 0210 Legislation And Regulation

*REFER ALSO TO CITATION(S) 1820, 1847*

1861 **(GAO/RCED—83-77) Opportunity to increase oil and gas exploration and lease rental income.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 28 Apr 1983. 12p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

As a general policy, the Federal Government does not issue oil and gas leases on lands that have been or may be designated as wilderness. Therefore, the Bureau of Land Management and the Forest Service generally do not process lease applications that include both nonwilderness lands and wilderness or potential wilderness lands. GAO found that over 1 million acres of the lands in the lease applications in seven western states involved nonwilderness lands. GAO believes the Bureau of Land Management and the Forest Service should implement joint procedures to segregate the nonwilderness portions of over-the-counter lease applications and lease them to willing applicants where practicable. For the seven states alone, this could increase the amount of federal lands available for oil and gas exploration and provide about $1 million in annual rental income.

## 0220 Transport, Pipelines, And Handling

*REFER ALSO TO CITATION(S) 1823, 1895*

1862 **Production and operation of a full-scale testing loop for studying disphasic flows.** Grouvel, J.M.; Corteville, J.; Grossin, M. pp 280-293 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The development of offshore oilfields is faced with the difficulty of predicting the behaviour of diphasic flows in the flowlines and transportation pipelines. Existing methods of computing head losses are notoriously imprecise and provide no indications concerning transient phenomena: plugs of liquid or gas, frequency and volumes, segregation, etc. This lack of knowledge often places operating configurations comprising diphasic removal to the coast out of the question, even though this solution would be advantageous thanks to its simplicity and low capital cost. Initial theoretical and laboratory studies very soon revealed that experiments in low diameter pipelines at low pressure and the existing methods of prediction were not enough, since the results could not be extrapolated to all types of petroleum pipelines. These studies have made it possible to define the characteristics of a loop for experimental study of diphasic flows, namely: diameter 6", length 125 m; slope variable between -10% and + 10%; fluids (hydrocarbons, gaseous and liquid); variable pressure, from 15 to 50 bars; average speed of phases: 0 to 10 m/s (gas), 0 to 3 m/s (liquid); and GOR under test conditions, 0.2 to 1000 $m^3/m^3$. This loop, built in 1976 at Boussens, near Toulouse, is described, together with the measuring facilities used to observe the phenomena concerned. The initial results of the measurements of high GOR flows in horizontal or rising pipelines illustrate phenomena that were hitherto unknown and the consequences of which on operation of real-life pipelines are mentioned. 3 figures.

1863 **Rigid flowline connecting and laying tests.** Levallois, E.; Pras, S.; Gouraud, O. pp 373-379 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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The Deep Sea Production Research Association, bringing together the Compagnie Francaise des Petroles, Societe Nationale Elf-Aquitaine and the French Petroleum Institute, carried out a coupling and laying test early in May 1977, lasting 15 days, on an 8" flowline between two undersea structures submerged in a depth of 50 m of water. For the first time, a flowline over 1000 m in length built ashore and towed a few metres above the bottom in a state of neutral buoyancy, was brought from the construction yard as far as the undersea site along a predetermined trajectory on the bottom and each end connected to a structure without in situ cutting to length. 3 figures.

1864 **Wide diameter flexible pipe with high performances and long lengths for great depths.** Laurent, J. pp 383-392 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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COFLEXIP, created in 1971, manufacturer of high performance long length flexible pipes for the offshore industry has developed a new flexible pipe specially for the great depths (550 m). The advantages of this flexible pipe in relation to rigid pipe are: laying less expensive, more reliable and faster; possibility of recovering the lines either to repair or for installation on another site (exploitation of short term or production tests). The characteristics of this flexible pipe are the following: weight/meter in the air empty, 295 kg/m; eight/meter in the water empty, 110 kg/m; minimum bending diameter in stock, 2.90 m; working pressure, 170 bar; test pressure, 260 bar; maximum axial load of static working, 180,000 DaN; maximum axial load of static working, 124,000 DaN; and hydrostatic pressure of breaking, 120 bar. 1 figure.

1865 **Deep sea repair of pipelines by mechanical coupling.** Fournie, R.; de Sivry, B. pp 393-405 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

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Undersea pipelines frequently call for repair work as a result of damage, and this compromises the task of evacuating the production fluids. Many repair operations are carried out by substituting for the defective section an inserted line connected at the ends by mechanical coupling. A study has been performed on the various existing systems and has revealed a number of weak points. These weak points, inherent to the types of packing, call into question the aptitude and reliability of these mechanical systems for repairs. This leads us to reconsider in its principle the problem of the link between the bare tube and the connector in order to eliminate the packing system and to improve the fixation of the connector.

Various techniques have been studied both as regards the methods of execution and their reliability and the result of this investigation has led to tests on the forming of collets with an angle of 30° and 45° of various lengths on a 10" tube. The findings would suggests a feasibility for this technique. The objective sought is to develop a metal-to-metal seal connector with reliability adequate to last the effective service life of the undersea pipeline. 8 figures, 1 table.

1866 **Laying pipelines by the RAT method.** Le Bihan; Vedrenne, J.P. pp 434-449 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Studies have been going on since 1974 on laying pipelines in depths of 300 metres. They have revealed the interest of the RAT (French acryonym indicating towing, end connection and tension) method which consists in prefabricating pipelines ashore in the form of long sections (about 100 metres), towing them afloat to the laying site, assembling them on the surface and laying the pipeline thus formed as assembly proceeds, by means of a stinger. The method is expected to provide the following advantages: lower cost, thanks to lighter laying facilities at sea; the possibility of laying pipelines at great depth, by using a dynamic anchoring laying support. The theoretical studies have been supplemented by tests in the testing tank which have shown the feasibility of towing, and by two sea trials at full scale, namely: a towing trial on a 16" diameter pipeline 1000 metres in length, which has shown that the towability of pipelines may vary from one pipeline to the other. An end connection and laying test on a 20" diameter pipeline, which has shown that a pipeline can be built and laid using a dynamic anchoring vessel. 6 figures.

1867 **General study and field testing of deep water submarine pipelines.** Sebastiani, G.; Banzoli, V.; Toffano, F. pp 472-486 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The continuous increasing of the offshore activities requires the development of a technology which allows pipelines laying operations in deep waters. TECNOMARE has faced this problem in an integral way, both from a theoretical and an experimental point of view. The computer programs necessary for a theoretical analysis of the behaviour of the laybarge, the stinger and the pipe have been issued. These programs have been checked by means of model tests and by comparing the theoretical results with the experimental results of the sea trials carried out in the Sicily Channel in 1976. Other computer programs necessary for optimizing the various subsystems (as mooring lines and stinger) have been developed together with the methods for the prediction of working times and down time of a laying spread. Finally the main problems involved in the project and in the analysis of pipe laying operations in very deep water (up to 1000 m) have been studied; capabilities and limits of the conventional techniques have been investigated and the necessary improvements have been identified. Furthermore new techniques and equipments which can improve the pipe laying operations have been studied (such as pipe connectors, multiple pipes laying, etc.). 4 references, 7 figures, 3 tables.

## 0230 Properties

*REFER ALSO TO CITATION(S) 1814*

1868 **(AD-A—130777/6) The use of fuel additives to control plume opacity of turbine engine test cells. Final report Mar 78-Oct 81.** Loveland, O.M.; Klarman, A.F.; Tarquinio, J.; Stoddart, T.L. (Air Force Engineering and Services Center, Tyndall AFB, FL (USA)). Apr 1983. 42p. NTIS, PC A03/MF A01.

This research, a joint Air Force/Navy study, evaluated the use of fuel additives to reduce the opacity of turbine engine test cell emissions. Automated smoke abatement system (ASAS) was used to inject ferrocene and XRG fuel additives into J57-43 turbine engines. Data obtained from this study indicate that ferrocene can be used to control test cell opacity without major impact on engine performance. The XRG fuel additive was not effective in reducing opacity. Major problems encountered with the ASAS were resolved during the project. Recommendations for further improvement of the ASAS were reported.

## 0240 Storage

*REFER ALSO TO CITATION(S) 1823*

1869 **(ORO—838) Baseline assessment of the Strategic Petroleum Reserve Project Management Office.** (Department of Energy, Oak Ridge, TN (USA). Oak Ridge Operations Office). 24 Oct 1983. 315p. NTIS, PC A14/MF A01. Order Number DE84002136.

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The Oak Ridge Operations Office (ORO) was assigned overall responsibility for implementation of the Strategic Petroleum Reserve Project (SPR) by the Secretary of Energy on June 15, 1983. One of the actions immediately initiated by the Manager of ORO was the establishment of a Task Force under a charter which included directions to conduct a review of the Strategic Petroleum Reserve Project Management Office (SPRPMO) in New Orleans, Louisiana, and to compile a report which would establish a baseline of the PMO status at the time of this major management transition. The purpose of this report is to document those findings and recommendations for use by the Manager of ORO. The Task Force was also chartered to conduct a full and complete review of all allegations of mismanagement and misconduct since inception of the program in 1977. The review of each allegation of misconduct and mismanagement will be documented in a second report which will be issued at a later date. By necessity, this report covers a broad range of project activities; therefore, within the allotted schedule, it was impossible to conduct an in-depth review and analysis of all of these areas. It is believed, however, that the materials contained within this report are representative of many of the conditions which prevail at the SPRPMO and should serve as a useful basis for management decisions.

1870 **Underwater storage tank system: a new conception for the storage of oil and methanol.** Wieske, P. pp 619-636 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The UWS reflects a new system for underwater storage, which can be used in unrestricted depths of water. A 100% separation of the surrounding sea water and the media to be stored is accomplished by a polyurethane separating diaphragm. By using prefabrication the capacity is almost unlimited and extensible at any time. Using a concrete steel base structure an adaptation to any erection required is feasible. Concurrently this concrete structure constitutes the ballast weight required for the transfer of forces. A specially designed transfer system enables to maintain a system operation even in a more severe seaway. By using a second, lighter medium a controlled and safe lowering of the system will be practicable in any location. 5 figures.

1871 **Underwater oil storage tank for 300 MWd.** Bozzo, G.M. pp 637-651 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A new concept of underwater oil storage tank has been designed in a comprehensive research project by TECNOMARE S.p.A. The all-steel gravity structure, suitable for 300 m water depth and for North Sea meteoceanographical conditions, has a total capacity of about 160,000 $m^3$ subdivided into 8 independent chambers. The oil water principle is being adopted. In each cham-

ber the crude oil is mechanically separated from the sea water by means of a rubberized diaphragm in order to avoid sea water pollution and to eliminate the treatment of displaced water. All the components of the underwater process system are placed into an atmospheric pressure steel module, fixed on the top of TECNOMARE underwater oil storage tank (TST). The general configuration and relevant installation procedure are illustrated. The very satisfactory results of the model tests achieved by the Netherlands Ship Model Basin in October 1978 have shown the validity and feasibility of the procedures. Experimental results of a test model, at 1:10 scale, of one chamber of TST with rubberized diaphragm, mainly devised to check the behaviour of the diaphragm during loading-unloading procedures, have confirmed the validity of the concept. Det Norske Veritas has been charged of the Precertification Review of the project. 3 references, 10 figures, 2 tables.

1872 **Installation of a submerged storage facility by means of a multi-articulation column.** Moinard, M. pp 652-662 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

An articulated column has been associated to a submerged storage facility in order to fulfill two functions: the first consists in controlling the lowering and installation of the storage tank during the immersion operations; the second provides a permanent link between the bottom and the surface. The column thus ensures transfer of the crude from the storage facility to the tanker while also acting as mooring station. The studies carried out covered a storage facility with an effective capacity of 160,000 cubic metres, submerged in a depth of 600 metres of water. For the case studied, the column consists of 3 elements and comprises 3 articulations. In a depth of 800 to 900 metres of water, the column would consists of 4 elements, while on articulation only would be enough in 300 metres. The columns and the storage tank are towed independently to the construction site. Before immersion, the tank is secured to the foot of the first column. Immersion is controlled by ballasting the tank and lowering is controlled by tilting the column. This operation is repeated after adding each successive element of the articulated structure. During immersion, the tank is filled completely with kerosene and water in proportions such that its apparent weight is neutral. Each sequence is illustrated by a film of the testing tank tests. 6 figures.

# 03 NATURAL GAS

## 0301 Reserves

*REFER ALSO TO CITATION(S) 1813*

## 0302 Geology And Exploration

*REFER ALSO TO CITATION(S) 1815, 1816, 1817, 1823, 1882, 1889, 3434*

1873 (DOE/METC—83-45, pp 11-19) **Some geological modeling aspects of reservoir simulation.** Knutson, C.F. (C.K. GeoEnergy Corp., Las Vegas, NV). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

Modeling concepts are mentioned which consider the gross geometry or permeability development in discontinuous reservoirs. Stochastic modeling assumes the reservoir can be defined by average scalers, e.g., average porosity, average water saturation, average permeability, etc. Actual reservoirs are heterogeneous and should probably be defined by tensor values, especially the permeability function. The optimum reservoir development can be simulated if the fracture dimensions and orientations and a comprehensive description of the reservoir characteristics, including the permeability tensors, are available. This allows a good fit of the development well pattern and fracture sizes. 6 references, 7 figures.

1874 (DOE/METC—83-45, pp 20-37) **Processing of geological and engineering data in multipay fields for evaluation.** Bankhead, C.C. Jr. (D.R. McCord and Associates, Inc., Dallas, TX). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

Recent oil and gas property trades involving multi-reservoir fields have required that studies be made within stringent time limitations. Evaluation of these fields has necessitated the evolution of a stream-lined method of gathering, cataloguing, processing, and interpreting the basic geologic and engineering data. Methods are outlined and an example shown for the rapid processing of such data and for the preparation of structure and thickness maps suitable for estimating reserves, predicting reservoir performance, determining development of the field for optimum primary and secondary recoveries, and establishing the basis for optimum future operating methods. 1 reference, 18 figures.

1875 (DOE/METC—83-45, pp 53-61) **Concepts and applications in modeling the Devonian shale.** Sawyer, W.K. (Math and Computer Services, Inc., Morgantown, WV). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

The concepts used in the development of the SUGAR models for the Devonian shale are discussed and illustrated graphically. The models have been given the acronyms SUGAR and SUGAR-MD, respectively, with SUGAR meaning Simulator for Unconventional GAs Resources and MD meaning Multidimensional. Several validation cases are presented that show that the models agree with published analytical solutions for both single porosity and dual porosity behavior. Two important applications of the model are presented. The first is a study of the effect of improved stimulation technology on production performance in three Ohio counties. The second is a hypothetical study of optimum well spacing and shows how the simulators may be used for maximizing resource recovery considering drainage size and reservoir anisotropy. 13 figures.

1876 **(PB—83-243972) Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82.** Brewer, R.L. (Global Geochemistry Corp., Canoga Park, CA (USA)). Apr 1983. 85p. NTIS, PC A05/MF A01.

Given the uncertainty of future world energy reserves, current knowledge of the origin and nature of natural gas needs to be expanded. The relative importance of processes of formation of natural gas will help in decision making for future exploration programs. The objective of this report is to define the origin, migration and present distribution of methane in the earth's crust, with particular emphasis on identifying abiogenic methane.

1877 **(PB—83-244004) Studies related to the deep earth gas. Annual report Jan-Dec 82.** Gold, T.; Bilson, E.; Soter, S. (Cornell Univ., Ithaca, NY (USA). Center for Radiophysics and Space Research). Jan 1983. 73p. NTIS, PC A04/MF A01.

The purpose of this research is to elucidate the origin of terrestrial hydrocarbons, principally of methane and petroleum. The authors report here their continued progress in experimental and theoretical studies conceived for this purpose. The role of methane in petroleum formation is being investigated in the study of two different type of reactions: the interaction of methane with petroleum hydrocarbons at high pressure and temperature and hydrocarbon reforming in methane pyrolysis. Evidence for the effectiveness of both processes is accumulating. Work is continuing on the pilot unit of a ground gas pressure monitoring system. They have carried out major theoretical studies on the relationship of nitrogen, helium and methane in the ground and on the mechanism of fluid migration in solid rock.

## 0303 Drilling, Production, And Processing

*REFER ALSO TO CITATION(S) 1822, 1823, 1824, 1825, 1827, 1828, 1829, 1830, 1831, 1832, 1834, 1839, 1844, 1845, 1849, 1875, 1877, 1898, 1899*

1878 (DOE/METC—83-45, pp 63-64) **Performance of wells in naturally fractured reservoirs.** Raghavan, R. (Univ. of Tulsa, OK). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

This work presents broad interpretive rules for analyzing Devonian shale wells based on simulated drawdown and buildup tests. It consists of two parts: (1) new pressure transient analysis methods for naturally fractured reservoirs and (2) unsteady flow to a well produced at a constant pressure in a fractured reservoir. The principal contribution of this work is the identification of a new flow regime during the early transient period. The discovery of this flow regime represents a major advance in our ability to analyze transient pressure tests. The identification of the new flow regime also explains the response of wells in fractured reservoirs that until now have been considered anomalous. Systematic procedures to analyze single well (drawdown and buildup) tests and multiwell (interference) tests are discussed.

1879 **(PB—83-254920) Field and laboratory support for the coproduction of gas and water program. Annual report 1 Apr 82-31 Mar 83.** Doherty, M.G.; Poonawala, N.A.; Osif, T.L. (Institute of Gas Technology, Chicago, IL (USA)). Aug 1983. 89p. NTIS, PC A05/MF A01.

Prospects for a possible demonstration of coproduction of gas and water from watered-out wells were analyzed and rank-ordered. An alternative prospect recommended by an operator was studied in detail. A field study of the No. 67 South Sand of Deep Lake Field was presented to the Superior Oil Company. Superior re-entered an abandoned well to collect additional data that led to the conclusion that there had been communication between the two lobes of the sand through the wellbore. As a result, the gas saturation was lower than originally projected. The PVT laboratory was used to study the effects of salt, gas, and salt and gas in combination on the compressibility and formation volume factor of water from 2000 to 20,000 psi. An isokinetic sampler was tested on a DOE geopressured aquifer test well. The results of samples taken indicated that certain inadequacies in standard oil field equipment used on the isokinetic sampler precluded accurate measurements of gas/brine ratios. A new design using coned and threaded equipment would greatly improve the sampler.

1880 **(PB—83-256651) Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83.** Way, J.D.; Bateman, B.R.; Larson, K.M.; Flynn, T.M. (National Bureau of Standards, Boulder, CO (USA)). Feb 1983. 50p. NTIS, PC A03/MF A01.

This report discusses a fundamental research to provide the basis for a new gas separation process, facilitated transport liquid membranes, which has the potential to overcome the selectivity problems inherent in conventional membrane separation processes and to investigate the mechanism for facilitated transport, the relationship between mass transport and system properties, and evaluate degradation problems in liquid membrane systems.

## 0305 Health And Safety

*REFER ALSO TO CITATION(S) 1821, 1846, 1854, 2454*

1881 **Safety problems in connection with offshore process plants, using, as example, a methanol production plant for gas fields.** Zeidler, G.; Baer, H.G. pp 704-715 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Using the example of a methanol plant on a jack-up platform, the requirements, problems and solutions regarding technical safety for such systems are covered. Safety techniques on sea installations have to be afforded more attention than do equivalent land installations since available area is very limited and various potentially dangerous areas are thus obviously more closely packed together. This situation leads to problems which do not have to be considered or solved in onshore installations. With due regard to the standards specified by Germanischer Lloyd hereinafter referred to as GL as the relevant classification company. The safety problems described into the following have been solved in such a way that Quality Assurance has been granted for the process system. This approval covers mechanical processing equipment, electrical equipment, instrumentation, safety and fire prevention systems, the flare system and plant arrangement.

## 0306 Marketing And Economics

*REFER ALSO TO CITATION(S) 1823, 1847, 1849, 1897, 2530, 2553*

1882 **(DOE/EIA—0419) Structure and trends in natural gas wellhead contracts.** O'Neill, R.; Heinkel, J.; Stokes, R.; Tawshunsky, A. (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). Nov 1983. 101p. NTIS, PC A06/MF A01 - GPO. Order Number DE84002336.

Several bills currently pending in the Congress would revise the Natural Gas Policy Act of 1978 (NGPA). A principal area of concern is how the structure of natural gas producer/purchaser contracts will impact the market under various regulatory and decontrol legislation. This report addresses the issues of natural gas wellhead contracts, how they have evolved in different regulatory environments and what changes may be foreseen under the legislative options currently being debated in Congress.

1883 (DOE/METC—83-45, pp 65-69) **Evaluation of gas producing potential from unmineable coal seams.** Johnson, F.S. (INTERCOMP Resource Development and Engineering, Inc., Houston, TX). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

INTERCOMP has evaluated the data from 40 well sites in 10 geologic basins from which DOE had gathered data. Production potential was reduced to one value called the production deliverability parameter phi which is defined as the cumulative production at the end of 10 years discounted at the rate of 15 percent per year. The various parameters that go into a reservoir simulator were left constant during this study except for what was determined in an earlier study to be the most significant factors, which included gas content, permeability, relative permeability, fracture length, and fracture permeability. For each well site the parameters not given were estimated, and maximum, minimum, and most likely values of phi were calculated. A relationship was developed between the breakeven value of phi and the depth to thickness of coal ratio, which included the price of gas. This relationship was used to rate the basins studied as to their potential for producing methane at a profit. The results were as follows: excellent potential - North Appalachian, Green River, San Juan, and Powder River; fail potential - Arkoma and Piceance Basins; poor potential - Warrior, Illinois, Tono, and Wind River Basins. 1 figure, 3 tables.

1884 **(PB—83-249458) Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83.** Lowry, J.F.; Brady, J.A. (Hagler, Bailly and Co., Washington, DC (USA)). Jun 1982. 147p. (RA—82-0115). NTIS, PC A07/MF A01.

An investigation of energy consumption in the U. S. agricultural sector reveals that natural gas is used on farms for a variety of purposes wherever a supply system is in place. However, only a small fraction of U. S. farms have access to gas, thus severely limiting the market for advanced natural gas-fired systems. While there is room for energy efficiency improvements in many equipment types, there is little justification for initiating a major RandD effort aimed exclusively at agricultural applications. Advanced equipment systems such as gas-fired dairy refrigeration equipment and gas-fired mobile apparatus have potential on-farm markets, but econom-

ic and technological constraints limit their potential in the near future.

## 0308 Environmental Effects

*REFER ALSO TO CITATION(S) 1821, 1854, 2900*

1885 **(UCID—19075-Vol.2) LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices.** Koopman, R.P.; Baker, J.; Cederwall, R.T.; Goldiwre, H.C. Jr.; Hogan, W.J.; Kamppinen, L.M.; Kiefer, R.D.; McClure, J.W.; McRae, T.G.; Morgan, D.L. (Lawrence Livermore National Lab., CA (USA)). Dec 1982. Contract W-7405-ENG-48. 810p. NTIS, PC A99/MF A01. Order Number DE84002466.

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During the summer of 1980, the Burro series of liquefied natural gas (LNG) spill experiments were performed at the Naval Weapons Center, China Lake, California. These experiments involved 8 spills of LNG and one of liquid nitrogen, each of approximately 40 $m^3$, onto water. A large array of instruments was used to make measurements of gas concentration, temperature humidity, heat flux from the ground, and turbulence within the dispersing gas cloud. A separate instrument array made measurements of the wind field both upwind of the spill and over the area in which the gas was dispersing. Volume II contains appendices for: wind field data and flowlines; horizontal gas concentration contours; and vertical gas concentration contours.

1886 **(UCRL—88495-REV.1) Recent results in simulating LNG vapor dispersion over variable terrain. Revision 1.** Chan, S.T.; Ermak, D.L. (Lawrence Livermore National Lab., CA (USA)). Nov 1983. Contract W-7405-ENG-48. 12p. (CONF-830802—4-Rev.1). NTIS, PC A02/MF A01. Order Number DE84003003.

From International Union of Theoritical and Applied Mechanics symposium on atmospheric disperation of heavy gases and small particles; Delft, Netherlands (28 Aug 1983).

The performance of a three-dimensional, conservation equation model (FEM3) is assessed herein via simulating three distinctly different, approximately 30 $m^3$ LNG spill experiments. In general, good agreement between model predictions and field measurements was observed and many important features associated with heavy gas dispersion were successfully reproduced. 7 references, 9 figures, 1 table.

1887 **(UCRL—89307) BAGI: a new concept for the detection and tracking of hazardous gases.** McRae, T.G. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 20p. (CONF-831195—1). NTIS, PC A02/MF A01. Order Number DE84001782.

From International congress on applications of lasers and electro-optics; Los Angeles, CA, USA (14 Nov 1983).

A new concept for the detection and tracking of toxic or flammable gases resulting from accidental spills or leaks is presented. The BAGI technique (backscatter/absorption gas imaging) integrates a laser and a flying-spot imager, and allows the normally invisible gases to be visualized on a standard TV monitor. BAGI parameters for a natural gas-detection system are discussed. 11 references, 7 figures.

## 0309 Artificial Stimulation

*REFER ALSO TO CITATION(S) 1801, 1821, 1869*

1888 **(DOE/METC—83-45) Unconventional-gas-recovery simulation workshop: technical proceedings.** Mercer, J.C.; Horton, A.I. (eds.). (USDOE Morgantown Energy Technology Center, WV). Sep 1983. 108p. (CONF-8210191—). NTIS, PC A06/MF A01. Order Number DE84000306.

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

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The goals of this workshop were fourfold. The first was to identify modeling needs that should be addressed by government-sponsored research. The second was to inform researchers about METC's assigned role as DOE's lead center for the study of unconventional gas recovery, particularly in developing predictive capabilities for: eastern gas shales; coalbed methane; tight sands; gas hydrates; deep source gas; and geopressured aquifers. The next goal was to establish a much needed and valuable interdisciplinary exchange of unconventional gas recovery information. The final goal was to address specific simulation topics: geologic modeling, stimulation modeling, and reservoir performance modeling. Each of the three sessions of the workshop covered one of these topics. Perhaps the most significant conclusion of the workshop is that every type of simulator discussed needs better input data. A need exists for more sophisticated methods of characterizing the reservoirs being studied to couple with the complexity of state-of-the-art models. This is true for all models, from the most sophisticated reservoir performance models to simplified field oriented predictive tools. Twelve extended abstracts in this proceedings were processed for inclusion in the Energy Data Base.

1889 (DOE/METC—83-45, pp 38) **Hydraulic fracture simulator theory and application.** Puchyr, P.J. (INTERCOMP Resource Development and Engineering, Ltd., Calgary, Alberta). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

Significant advances have been made in the design of hydraulic fracture treatments through the application of INTERCOMP's Hydraulic Fracture Simulator (HFS). HFS was developed by Settari and Cleary, and their results were presented at the SPE 1982 Annual Fall Meeting in New Orleans. HFS simulates the entire simulation process, from fracture initiation through post-fracture production. The numerical procedures developed by Settari and Cleary enable rapid simulation turnaround, thus creating a cost efficient model. HFS is the integration of three models: a reservoir simulation model, a fracture mechanics model, and a proppant transport model. HFS is being commercially applied by INTERCOMP. A sufficient number of projects have been completed to demonstrate that HFS is a viable and practical tool. Typical applications include history matching of post-fracture performance, design and optimization of treatments, and sensitivity analyses.

1890 (DOE/METC—83-45, pp 39-40) **Development of a 3-D simulator for hydraulic fracturing.** Sinha, K.P. (Terra Tek International, Salt Lake City, UT). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

The hydraulic fracturing simulator that has been developed at Terra Tek is a three-dimensional model that considers two-dimensional flow for a vertical fracture, though there is no restriction if the fracture is horizontal. Vertical fractures are considered most often because that is what we are usually dealing with in a simulation. The model considers two-dimensional flow. The elasticity (or solid deformation), the fracture mechanics considerations, and the fluid flow equations have all been considered and are coupled in the model. Terra Tek is trying to build the model on rational, well-defined principles of mechanics with very few or no assumptions that cannot be backed by acceptable rationale. The company is now at the stage where it is introducing many of the practical capabilities into the model, and will continue updating these.

1891 (DOE/METC—83-45, pp 41-42) **Simulation and evaluation of explosive/propellant stimulation treatments.** Young, C. (Science Applications, Inc., Steamboat Springs, CO). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

Science Applications, Inc. (SAI) has performed an extensive numerical modeling, or simulation, effort to evaluate conventional explosive stimulation treatments and numerous variations thereto. These simulations were conducted using an explicit finite-different computer program call STEALTH. STEALTH is based upon and numerically similar to programs such as HEMP and TOODY, developed and utilized extensively by the National Laboratories. The

STEALTH finite-difference programs can treat a variety of thermo-mechanical problems in either one or two dimensions. The results of these numerical simulations, combined with other theoretical and experimental studies on explosive treatments, indicate that the design of explosive/propellant stimulation treatments, so as to signficantly reduce wellbore damage and enhance gas penetration of induced fractures, could significantly improve the stimulation results achieved with such treatments. 1 figure.

1892 (DOE/METC—83-45, pp 43-47) **Status of technology associated with hydraulic fracture modeling.** Advani, S.H. (Ohio State Univ., Columbus). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

Recently, considerable emphasis has been placed on the development and testing of innovative well stimulation techniques for the recovery of unconventional gas resources. The design of optimal hydraulic fracturing treatments, for specified reservoir conditions, requires sophisticated models for predicting the induced fracture geometry and interpreting governing mechanisms. In this presentation, a summary review of hydraulic fracture modeling work is given. Methodology and results pertinent to hydraulic fracture modeling for the US DOE's eastern gas shales program are reported. The finite element model simulations presented extend available modeling efforts and provide a unified framework for evaluation of fracture dimensions and associated responses. In addition, the effects of layered strata, in situ stresses, fracture-fluid properties, failure criteria, and bimaterial interface characteristics are discussed along with selected numerical experiments and novel stimulation concepts. 30 references, 2 figures.

1893 (DOE/METC—83-45, pp 50-52) **Design of hydraulic fracturing treatments.** Cleary, M.P. (Massachusetts Inst. of Tech., Cambridge). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

An ongoing hydraulic fracture simulation project at the Massachusetts Institute of Technology is the development of MIT UFRAC. The project has five major aspects. It is addressing fracturing mechanisms, including hydrafrac, dyna frac, thermal cracking, and chemical cracking. Secondly, it includes developing models for the more promising of these mechanisms, particulary hydrafrac. Laboratory simulations are included for model verification. Finally, of lesser emphasis, is the study of techniques for monitoring the evolution of fractures in the field, mapping fractures, in other words. The overall objective of the project is to recommend procedures to both improve current field operations and develop new technology. Eventually, a design handbook will be written for the fracturing operations that are modeled, particularly hydraulic fracturing. MIT has been developing a complex, comprehensive model, as well as simpler models that contain most of the components of hydraulic geometry. The simpler models rely on fluid flow and rock strength coefficients, such as volume coefficient, crack opening coefficient, pressure slope coefficient, and vertical propagation coefficient, to represent complex occurrences within the fracture. These numbers are then used in a pocket calculator to predict fracture stimulation results. At present, two calculator programs have been developed by MIT, an explicit version and an implicit version. 2 figures.

1894 (DOE/METC—83-45, pp 70-73) **Simulation of Devonian shale infill drilling.** Horton, A.I. (Morgantown Energy Technology Center, WV). Sep 1983. NTIS, PC A06/MF A01. (CONF-8210191—).

From Unconventional gas recovery simulation workshop; Morgantown, WV, USA (26 Oct 1982).

The Morgantown Energy Technology Center performed a reservoir simulation study of the Devonian shales in Meigs County, Ohio, using a dual porosity shale reservoir simulator, developed for modeling gas production from the naturally fractured shales. The study focused on a gas producing area, operated by Columbia Gas Corporation, which contains 15 wells producing from the Devonian shale. The study investigated the possible impact of infill drilling in established areas of eastern gas shales production. Preliminary economic analysis of the simulated production indicated that, although large amounts of gas production may be possible by infill drilling, it may be subject to a slow return on investment. If well costs are kept low, production is increased by advanced stimulation, or gas prices increase, this may change. The infill drilling study is being continued with advanced stimulation techniques being applied to the new wells and economic analysis of all scenarios. 3 figures.

1895 **(PB—83-242305) Tight gas sands evaluation and technology development. Final report Jan 79-Nov 82.** (CER Corp., Las Vegas, NV (USA)). Mar 1983. 123p. NTIS, PC A06/MF A01.

This project was designed to research and develop the technology necessary to enhance natural gas supply from unconventional low-permeability (tight) gas sands. The project which began in 1979 was initially designed to collect and analyze field data in cooperation with the U.S. Department of Energy (DOE). In 1980, the focus was shifted towards independent near-term gas supply project plan development and away from DOE association. A tight gas sands technology matrix was developed, and seven basins, which were not under concentrated study by DOE, were surveyed.

1896 **(PB—83-242313) Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82.** Dietz, C.F.; Knowles, J.H.; Larsen, V.E.; Merry, R.D.; Oldham, D.W. (Colorado School of Mines, Golden (USA). Research Inst.). Jun 1982. 147p. NTIS, PC A07/MF A01.

The Raton and Piceance basins were selected as study areas for developing a basic exploration rationale for Western U.S. coal bed methane. The general approach of the rationale consists of an analysis of four geologic areas: the occurrence of coal, permeability development, thermal maturity, and trapping mechanisms. For predicting the occurrence of coals, a regional stratigraphic analysis is suggested. Permeability in coal reservoirs is dependent on fracture (cleat) development, and an understanding of the origin of fractures is fundamental to fracture prediction. Thermal maturity (a measure of organic metamorphism) determines the methane capacity of the coal and is predicted by mapping vitrinite reflectance. Trapping mechanisms for methane in coal involve the occurrence of water in the coal reservoirs and the preservation of methane; the general approach is to analyze reservoir communication. Examples of the application of the rationale are provided.

1897 **(SAND—83-2137) High-energy gas-fracturing development. Quarterly report, July 1983-September 1983.** Cuderman, J.F. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1983. Contract AC04-76DP00789. 44p. NTIS, PC A03/MF A01. Order Number DE84001364.

The objective is to develop and optimize the High Energy Gas Fracturing (HEGF) technique to produce multiple fractures around a wellbore in order to stimulate natural-gas production in Devonian shale. A propellant-based fracture technology has been developed that permits control of pressure loading to produce multiple fracturing in a borehole. Experiments at Rowan County, Kentucky and Meigs County, Ohio, have transferred this technology, developed in ash-fall tuff at the Nevada Test Site (NTS), to Devonian shale. Results closely match the predictions of the semi-empirical model. A systems-analysis model has been constructed to evaluate the economics of HEGF. Tasks during the report period have concentrated on conducting HEGF experiments in Devonian shale, on further refinements to the finite-element model, on borehole-TV-image processing, and on initiating a cost-benefit analysis of HEGF stimulations in gas wells with measurable production. 8 references 7 figures, 3 tables.

## 0310 Legislation And Regulation

*REFER ALSO TO CITATION(S) 1847, 1855*

1898 **(GAO/RCED—83-102) Issues facing the future use of Alaskan NorthSlope natural gas.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 12 May 1983. 158p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Report to the Honorable Ted Stevens, United States Senate.

The North Slope of Alaska contains over 26 trillion cubic feet of natural gas. In 1977, the President and the Congress approved construction of a 4800-mile gas pipeline to bring this gas to US consumers by 1983. However, completion of the project is not now expected until late 1989 at the earliest. This report examines the status and outlook for the Alaskan gas pipeline (the Alaska Natural Gas Transportation System). It also evaluates the pros and cons of (1) alternative systems to deliver this gas to market, including a gas pipeline with Alaska for export of liquefied natural gas; (2) processing the gas in Alaska by converting it to methanol and petrochemicals for export; and (3) using the gas within Alaska.

## 0320 Transport, Pipelines, And Handling

*REFER ALSO TO CITATION(S) 1823, 1857, 1858, 1859, 1860, 1861*

1899 **Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding.** Vedrenne, J.P.; Mugneret, J.; Fournie, R. pp 406-422 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Among techniques for undersea connection of pipelines, welding is the one offering the highest degree of confidence. During recent years, hyperbar welding has become operational down to a depth of 150 m and current research work will enable it to be extrapolated down to about 300 m. In 1973, this technique had been used only for welding on risers to depths of under 100 m and never for connection of undersea pipelines. To achieve this objective, a series of studies on hyperbar welding connecting equipment was carried out. The studies led to a connecting test at a depth of 150 m in November 1974 in the Mediterranean. For laying the gas pipeline from the Frigg field to Scotland, this technique was chosen for the connections. Below a depth of 300 m, a two-fold limitation arises with this technique owing to the effects of the ambient pressure: that on the divers and that on the well. This is why, in 1975, the development of a new method was undertaken: undersea welding at atmospheric pressure (the WELDAP method). The technique aims at a range of application of down to 1000 m depth. The project followed the following three development phases: manufacture and shore testing of the equipment; connecting tests at shallow depth (30 m); and connecting tests at great depth (264 m). The final test took place in a Norwegian fjord in February 1978. 5 figures.

1900 **Design and testing of a flexible line suitable for gas transportation.** Peinado, M. pp 423-433 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Within the framework of the high pressure flexible gas line project conducted jointly by CFP, IFP and SNEA(P) concerning the development of flexible pipelines for undersea transportation of gas at high pressure, two types of flexible structure were experimented on the Lacq field: smooth bore and rough bore. Two types of polymer were used, the choice of which is the outcome of prior studies in the laboratory, one for internal seal applications, the other for external seal applications. The results obtained from 1st April 1974 to 30th June 1977 show firstly that owing to the risk of crushing of the internal seal tube, the rough bore structure is to be preferred to the smooth bore structure for transportation of gas and secondly that the sealing materials chosen proved satisfactory for a cumulative testing period of about one year. Nonetheless, the same tests must be continued for two or three years further, involving cyclical bending stresses capable of simulating dynamic working of the materials. 4 figures, 4 tables.

1901 **Castoro Sei introduces new standards of reliability and efficiency in pipelaying.** Colonna, S.; Dall'aglio, D.; Rosa, G. pp 450-471 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A concise outline of the basic design and the consequent main features of Castoro Sei is given. Based on the first assignment of Castoro the Messina Straits crossing (20" OD lines in 360 meters of water), main design criteria are confirmed against an actual advanced project. As a consequence of the operational results so obtained a basis for technical and economic evaluation is indicated for projects falling within the following categories: projects with an extreme environment and/or water depth which cannot be handled by traditional lay vessels; projects which can be handled by traditional lay vessels under severe environment; and projects under moderate environment (water depth) where advanced lay systems such as Castoro Sei compete with tradiational barges on the basis of overall economics (reliability and safety). 5 figures.

1902 **Offshore LNG transfer system.** Jones, E. pp 569-580 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A need to conserve associated gas from the North Sea Oil Fields has been identified and David Brown-Vosper with EEC support has undertaken to develop an Offshore Transfer System. A basic fundamental unit of a transfer system: a cryogenic swivel is described. A transfer system suitable for the North Sea between a terminal with limited movements and a lively LNG carrier is described. The key points of the transfer unit is a design which retains the best advantages of a rigid pipe and flexible hose system. The envelope and dynamic conditions are satisfied by the movement of a balanced outer arm and flexible hose strings. A major requirement of any transfer system will be a safe connect-disconnect. This is achieved by a three stage system: elevation/hold; orientation; and coupling. 5 figures.

1903 **Long distance transport of LNG via cryogenic pipeline.** Berbesson, J. pp 581-598 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

The liquefied natural gas market is booming. It appears logical to consider whether LNG can be conveyed towards the hinterland via pipeline, from the ports where the methane tankers are received. A study of this problem has been carried out for the EEC by Societe OTP and the main points are summarized in the present communication: study of materials and equipment; design of a cryogenic pipeline; capacities and transportation distances; and economic study. The study shows that it is perfectly possible to implement such structures, that the cost of transportation is of the same order of magnitude as that of a conventional gas pipeline and that the energy savings involved represent more than half the energy needed for a conventional gas pipeline of the same capacity. 3 figures, 1 table.

### 0330 Properties

*REFER ALSO TO CITATION(S) 2078*

### 0340 Combustion

*REFER ALSO TO CITATION(S) 3023*

1904 **Utilization of marginal offshore gas deposits by means of mobile offshore power stations.** Brandes, H.; Reichel, H.; Schiemichen, P.C. (Deutsche Babcock AG, Oberhausen, Germany). pp 233-262 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

A number of so-called marginal gas deposits which, for reasons of volume and/or quality are not economically exploitable be means of conventional techniques, have been found on the various continental shelves. One possibility for the economic and environmentally acceptable utilization of these not insignificant reserves is thought to be the direct conversion of the deposits into power using mobile, floating offshore power stations sited over the deposit. The electric power generated would be transmitted to an input station on an existing high-voltage grid by means of a high-voltage dc transmission system - the only existing system by means of which bulk production can be transmitted with acceptable losses. The special conditions at the site and the requirements of profitability, particularly because of the high investment costs, determine the design of the supporting structure and power station and the method of operating the power station. A supporting structure in the form of a jack-up platform has been developed. Because of the high investment costs, it will be necessary to run the power station to produce base-load current. For this purpose a high-efficiency and high-availability process will need to be applied. It was decided that the technically and economically most suitable system would be a gas turbine combined with a waste-heat boiler. A comparison between the production costs for this installation and a nuclear power station show that the former is profitable. 5 figures.

1905 **Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy.** Hucknall, D.J.; Willatt, B.M.; Hockham, R.J. (J & S Sieger Ltd., Poole, Dorset, England). pp 345-359 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

By means of Auger Electron Spectroscopy and X-ray Photoelectron Spectroscopy, information has been obtained regarding the effects of certain catalyst poisons (chlorinated hydrocarbons, hexamethyldisiloxane and hydrogen sulfide) on supported palladium catalysts. Thus, Pd on $Al_2O_3$ + $ThO_2$ catalysts were prepared in the form of commercial gas detectors and exposed to small amounts of inhibitors. In all cases, with the possible exception of hydrogen sulfide, these substances destroyed the activity of the catalysts towards the oxidation of methane. Deactivated catalysts were then examined using x-ray photoelectron spectroscopy and Scanning Auger electron spectroscopy. As expected, the spectra showed predominantly those peaks due to Pd, O, Al and Th. Peaks from the inhibitor molecules (C, Cl and Si) were also present but were much less intense, reflecting the relatively small amounts of these impurities required to bring about deactivation. By measuring the energy of either the Auger transitions or the electron binding energies characteristic of the catalyst and support, results were obtained concerning the nature of the interactions of the inhibitors with catalytic gas sensors. Thus, it appeared that chlorinated hydrocarbons reacted with the active form of palladium (Pd(II)0) on the surface while $H_2S$ reacted with the $Al_2O_3$ support by a spillover mechanism. Argon ion erosion showed that hexamethyldisiloxane was not only present on the outer surface of the detectors but also deep within the structure of the support, causing an irreversible deactivation. 14 references, 6 figures, 3 tables.

### 0350 Storage

1906 **Red Lake Salt Cavern gas storage project, Mohave County, Arizona.** *EIS (Environmental Impact Statements);* **6**: No. 9, 5(Sep 1982).

Implementation of the Red Lake Salt Cavern Gas Storage System in Mohave County, Arizona is proposed. The project would include development of a gas storage field composed of two subsurface solution-mined salt cavities, 30 miles of 16-inch-diameter gas pipeline, an onsite electric generator, four 345-kilowatt generators, facilities to provide for 5,400 horsepowers of compression, appurtenant site access roads, and a brine evaporation pond. The caverns would be used to store gas under pressure during periods of low demand for delivery to customers during periods of high demand to ensure an adequate supply of natural gas for consumers in Nevada and portions of Arizona and California. Development of the facility would result in disturbance of 1,200 acres. Dike or floor failure at the evaporation ponds could result in seepage of brine to adjacent areas. Groundwater withdrawals associated with the project could result in overdrafting of the regional aquifer. Some cultural resources could be disturbed. Sale of salt recovered during the project at a lower price than was available from the regional salt distributor would cause the regional distributor to lose business.

## 04 OIL SHALES AND TAR SANDS

### 0403 Drilling, Fracturing, And Mining

1907 **(DOE/LC/10962—1) Evaluation of mechanical excavation systems for oil-shale mining. Final technical report.** Ozdemir, L.; Miller, R.J.; Sharp, W.R. (Colorado School of Mines, Golden (USA). Excavation Engineering and Earth Mechanics Inst.). Jul 1983. Contract AC20-82LC10962. 145p. NTIS, PC A07/MF A01. Order Number DE83016121.

This report presents the result of an investigation into evaluating the technical and economic feasibility of applying mechanical excavation techniques to oil-shale mining. The study was funded by the Department of Energy, Laramie Technology Center. Based on the findings of this investigation, it was concluded that mechanical excavation systems offer a great potential for oil-shale mining in terms of high production and reduced costs compared to conventional methods. While some of the systems evaluated can be applied to oil shale economically in their present stage of development, others require additional improvements to ensure maximum benefit and applicability for various aspects of oil-shale mining operations. It is also suggested that current mine-design approaches may need to be modified to gain maximum advantage from potential utilization of mechanical excavation techniques.

### 0404 Oil Production, Recovery, And Refining

1908 (INIS-mf—8473, pp 94-99) **Application of the HTGR in tar sands oil recovery.** Rao, R.; McMain, A.; Quade, R. (General Atomic Co., San Diego, CA (USA)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The study presented in this paper explored the potential application of a high-temperature gas-cooled reactor (HTGR) to supply both process steam and cogenerated electric power for tar sands oil recovery and upgrading. The raw product recovered from the tar sands is a heavy bitumen. Upgrading, which involves coking and hydrodesulfurization, produces a synthetic crude (refinable by current technology) and petroleum coke. Energy requirements by form for each process are considered. An HTGR plant could be the most economical source of steam and electric power. This paper includes a description of the HTGR plant, a heat cycle and energy balance developed for a typical commercial tar sands oil recovery operation, and a schematic field arrangement showing the coupling of the HTGR to the process. Data developed during this

study include expected bitumen recovery, economic data, and a comparative assessment of the HTGR application for tar sands recovery.

### 0405 Properties And Composition

1909 **(UCID—19917) Reproducibility of chemical analyses of raw Colorado oil shales.** Carley, J.F. (Lawrence Livermore National Lab., CA (USA)). 29 Aug 1983. Contract W-7405-ENG-48. 66p. NTIS, PC A04/MF A01. Order Number DE84002146.

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This study was undertaken to establish the real magnitudes of the errors of the determinations of total carbon, acid-evolved carbon dioxide, organic carbon, total nitrogen, total hydrogen, and total sulfur in oil shales ranging the natural gamut of kerogen richness. Four shales, one low in kerogen, two of medium kerogen content, and one very rich shale, were divided into twelve samples each. These were submitted for analysis, randomly and under blind labels, over a 15-month period. The results show that the true errors of the carbon and sulfur analyses are much larger than replicate differences would indicate, while intersample variance was comparable to between-replicate variance for nitrogen and hydrogen. Still, the errors for total carbon, nitrogen and hydrogen, as determined with the Perkin-Elmer elemental analyzer, are comparable to or smaller than those expected for fully combustible compounds by Perkin-Elmer experts. Historical plots of within-group variations show definite biases which may be correctable but whose causes have not been found. Samples about ten times larger than the 2-mg samples recommended for pure combustible compounds are probably appropriate for oil shale. A regular quality-control program should be instituted for these analyses.

### 0406 Direct Uses And By-products

1910 **(PB—83-244475) Fluidized combustion of oil shale. Final report.** Yavuzkurt, S.; Gutfinger, C.; Dayan, J. (Technion-Israel Inst. of Tech., Haifa. Dept. of Mechanical Engineering). Sep 1979. 22p. NTIS, PC E03/MF E01.

Combustion of oil shale requires operation under carefully controlled conditions. Fluidization experiments were made with different sized oil shale particles. Minimum fluidization velocities and other fluidization characteristics were determined at room temperatures. Thermogravimetric data were used to monitor the amount of organic matter and carbonates, providing the needed information on the degree of combustion and the amount of carbonates decomposed. The parameters varied during the combustion experiments were: fluidization velocity, particle size distribution, air-to-fuel ratio, bed height and the residence time in the reactor.

### 0410 Enviromental Aspects

*REFER ALSO TO CITATION(S) 1799*

## 05 NUCLEAR FUELS

### 0501 Reserves

1911 (INIS-mf—8473, pp 113-122) **Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles.** McLean, D.R.; Vijayan, S. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A bell-shaped distribution analysis for non-renewable resource utilization forecasts has been applied to crude-oil and uranium resources in the world and in Canada. The distribution identifies potentially sensitive stages in the supply-demand balance. It reveals that a shortfall in supply with respect to exponential growth in demand begins to occur prior to peak production and at a stage when only about 1/3 of the resource has been consumed. Bell-shaped production curves have been prepared for uranium resources for the world, (excluding the centrally planned regions) and for Canada, based on a once-through fuel-cycle and relatively low nuclear-growth scenarios. They have demonstrated that, using the assured categories of uranium resources, shortages in uranium supply would begin to develop as early as the year 1993 in the world and 2003 in Canada. If resources in the estimated additional categories are included, the shortages would not develop until 1998 and 2034, respectively. For the world, options for responding to shortages in uranium include plutonium recycle in thermal reactors, the use of low-enriched uranium in CANDU reactors and the adoption of thorium fuel cycles and fast breeders. Plutonium will be a key source of energy to meet the growing demand for electricity and to substitute for shortfalls in oil and uranium supplies. Worldwide efforts should be undertaken soon to ensure its availability by the turn of the century. If a firm commitment were made today to adopt the thorium fuel cycle in Canada, the earliest date by which it could make a significant contribution to Canadian energy needs would be the mid 2030s. It may be possible to avoid uranium shortages in Canada before that time, if extensive exploration activity shows that uranium resources in the unassured categories do indeed exist.

1912 **Origin of uranium and other metal concentrations in the Helmsdate granite and the Devonian sediments of the north-east of Scotland.** Tweedie, J.R. Aberdeen, Scotland; Aberdeen University (1981). 417p. British Library, Boston Spa, Wetherby, West Yorks. No. D44757/83.

An examination of the radiometrically anomalous Caledonian Helmsdale granite and certain radiometric localities in the Devonian sediments of Caithness has been undertaken in order to discover the processes of U concentration in the different rock types. The study is based mainly on geochemical examination, with analyses for U, Th, Cu, Zn, Pb, Mo, Zr, Rb, Sr, Bi, Se, $P_2O_5$, and $K_2O$ being carried out. The granite was found to have a high mean U content (9 ppm), approximately twice that expected from comparison with the world granite average (4 ppm), whilst zones of intense alteration gave U enrichments of up to 71 ppm. These latter have a mineralogy and geochemistry distinct from the normal granite. A limited Cu-Mo stockwork mineralisation was discovered almost coincident with a highly radioactive hydrocarbon vein. The main U concentrations in the Caithness sediments occur in thin phosphatic horizons. In these, U ranges from 100 to 1000 ppm and is paralleled by the phosphate in an approximately linear relationship of 100 ppm U/1% $P_2O_5$. Black shales contain low level U concentrations with anomalously high Zn and/or Mo. (author).

1913 **Uranium and thorium reserves of the world. Prospecting, mining, and costs.** Dietrich, G. Aachen, Germany, F.R.; Technische Hochschule (1968). 99p. (In German). Library of the Technische Hochschule Aachen (Germany, F.R.).

After a short historic review of uranium exploration, a survey of the uranium and thorium deposits is given. The description of the world reserves of uranium and thorium that follows is based on a publication of the OECD/ENEA of 1965. Further chapters are concerned with prospecting methods and uranium mining. (UA).

### 0502 Exploration

*REFER ALSO TO CITATION(S) 1907*

1914 **(SAND—83-1214) Computer codes for PFN and multi-element log analysis.** Barnard, R.W. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1983. Contract AC04-76DP00789. 59p. NTIS, PC A04/MF A01. Order Number DE84003154.

Analysis and interpretation of Sandia National Laboratories' Prompt Fission Neutron and Multi-Element logging data have relied heavily on computers. This report describes the computer programs used for these purposes. Both locally-written and public domain codes have been used, and are described here. The intent of

this report is to discuss the function and features of the programs, but not to describe the mechanics of the programming; this is contained in the commented listings of the codes, which are available from the author. The codes described in this report cover field logging tape conversion, data reduction for Prompt Fission Neutron logs, Multi-Element logs, and ancillary logs, and plotting and listing of analyzed results. All the codes written for this project at Sandia National Laboratories are in the public domain, and are available from the author.

## 0503 Mining

*REFER ALSO TO CITATION(S) 2044*

1915 **(INIS-mf—8605) Uranium (Yeelirrie) Agreement Act, 1978 - No. 110 of 1978.** (Western Australia). 12 Dec 1978. 55p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704407.

This Act ratifies an Agreement between the State of Western Australia and Western Mining Corporation Ltd. with respect to the mining and treatment of certain uranium ore reserves. It lays down detailed provisions concerning the obligations of the State and of the Corporation and provides, in particular, for the construction and operation by the Corporation of a metallurgical research plant following prior approval by the State, as well as for a uranium ore mining and treatment project to be proposed to the State within 4 years of the date of the Agreement. (NEA).

1916 **(INIS-mf—8606) Uranium (Yeelirrie) Agreement Act 1982 - No. 40 of 1982.** (Western Australia). 27 May 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704408.

The Uranium (Yeelirrie) Agreement Act 1978 was amended in particular to include references to the Mining Act 1978 and to redefine the term "mineral claim". (NEA).

1917 **(INIS-mf—8611) Roxby Downs (Indenture Ratification) Act, 1982 (No. 52 of 1982).** (State of South Australia). 21 Jun 1982. 121p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704409.

This Act ratifies a contract between the State of South Australia and a group of companies covering the construction, maintenance and operation of a mine in the Olympic Dam Area or another selected area and related facilities, in particular a treatment plant. The minerals to be worked include uranium.

1918 **(PB—83-234997) Development of environmentally attractive leachants. Volume 1. A minitest for in situ uranium leaching.** Schechter, R.S.; Lake, L.W.; Kabir, M.I. (Texas Univ., Austin (USA). Dept. of Petroleum Engineering). 31 Jan 1983. 315p. NTIS, PC A14/MF A01.

A minitest, consisting of a central injection production well surrounded by at least two observation wells designed to detect the arrival of injected fluid, leached minerals, and nonideal flow, is described in the report. The goals of the test are to determine the susceptability of the host formation for uranium leaching, to establish important kinetic parameters so that the results of the minitest can be used to correctly scale the process and to identify those factors that may render site restoration difficult. This Bureau of Mines report considers nonidealities such as reservoir permeability heterogeneities, nonuniform mineral distribution, and minerals other than uranium that may react with the leach solution. To circumvent these difficulties, methods of interpretation have been proposed and tested by analysis of realistic data generated by a computer simulator.

## 0504 Feed Processing

*REFER ALSO TO CITATION(S) 1909, 1910, 2886*

1919 **(INIS-mf—8626) Protocol between the National Laboratory of Industrial Engineering and Technology of Portugal and the Junta de Energia Nuclear of Spain on supply and transfer of technology on uranium extraction from phosphoric acid.** (Portugal). 17 Mar 1982. 10p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704412.

Also in Spanish.

This Protocol was signed between the JEN and the LNETI, in the framework of the Agreement of 14th January 1971 between Spain and Portugal for co-operation in the peaceful uses of nuclear energy. It is provided that the JEN and the LNETI will promote the application of their respective technologies in the field in Portugal as well as that of technology jointly developed on such extraction. The Protocol, which became operational on its date of signature will remain in force for five years. (NEA).

1920 **Synthesis and ion exchange properties of grafted poly(p-phenylene terephthalamide).** Whelan, M.P. Stellenbosch, South Africa; Stellenbosch University (1982). 142p. Registrar University of Stellenbosch, Victoria St., Stellenbosch, 7600, South Africa.

The evolution and present state of the art of ion exchange is described. A new generation of ion exchange resins that is receiving attention is ion exchange fibers, but these fibers are mechanically weak. In this thesis the preparation and uranium loading properties of ion exchange fibers based on the high tensile strenght PPTA fiber, poly(p-phenylene terephthalamide), is described. 4-Vinylpyridine was grafted directly onto the fiber by gamma irradiation to give a 45.9% graft yield. Epichlorohydrin was grafted directly onto the fiber by cationic initiation to give a maximum graft yield of 1.6%. Model compound studies failed to identify either the site of grafting or the grafted material, but poly(ethylenimine) was grafted onto these fibers with the concurrent liberation of chloride. Direct grafting of the fiber initiated by manganese(IV) and cerium(IV) redox techniques was unsuccessful. Model compound studies showed that the PPTA fiber could be N-allylated via a lithiated intermediate. This fiber was grafted with 4-vinylpyridine initiated by dibenzoyl peroxide to give a graft yield of 1,5%. After hydroxylating the allyl substituent, cerium(IV) initiated redox grafting of 4-vinylpyridine gave graft yields up to 41.7%. The uranium loading of the gamma irradiation grafted fiber is comparable to that of a crosslinked poly(vinylpyridine) bead resin in simulated and clarified uranium leach liquors. The fiber had faster loading kinetics than the bead resin in these solutions. A reason for the fiber's low loading in pulp is suggested.

## 0505 Enrichment

*REFER ALSO TO CITATION(S) 2064*

1921 **(UCRL-Trans—11919) Process and apparatus for the separtaion of isotopes.** Ma, I.J. (Lawrence Livermore National Lab., CA (USA)). 6 Nov 1983. Contract W-7405-ENG-48. Translation of German Patent No. 2,549,311. 25p. NTIS, PC A02/MF A01. Order Number DE84002198.

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A process is claimed for the separation of isotopes particularly uranium isotopes, characterized by the fact that this process is based on the charge exchange reaction ($A^+ + B \rightarrow A + B^+$), with the atomic ions $A^+$ of one of the isotopes of an element being selectively excited and the atomic ions of the other isotope of the same element being allowed to remain in the ground state, and with the excited ions being neutralized by means of atoms or molecules (B) after the charge exchange reaction has been completed. For the selection of an atom or molecule B the first ionization potential thereof should be greater than the ionization potential of uranium. Laser radiation is used to excite the atoms.

1922 **(UCRL-Trans—11920) Apparatus for enrichment of uranium by double photoionization.** Laude, J.P. (Lawrence Livermore National Lab., CA (USA); Instruments S.A., 94 - Ivry-sur-Seine (France)). Nov 1983. Contract W-7405-ENG-48. Translation of French patent application No. 74,19703. 6p. NTIS, PC A02/MF A01. Order Number DE84002623.

The present invention concerns enrichment of uranium by double photoionization. The use of a beam from a dye laser for excitation of gaseous uranium is known and the present invention concerns an apparatus of this type. The purpose of the invention is essentially to produce an apparatus having high energy efficiency. This is achieved according to the invention by using a continuous wave laser.

1923 **(UCRL-Trans—11921) Apparatus for isotopic separation using a high-frequency wave and coherent radiation.** Mourier, G. (Lawrence Livermore National Lab., CA (USA); Thomson-CSF, 75 - Paris (France)). Nov 1983. Contract W-7405-ENG-48. Translation of French patent application No. 77,38827. 17p. NTIS, PC A02/MF A01. Order Number DE84002622.

The purpose of the present invention is an apparatus for industrial separation of isotopes, using a high-frequency electromagnetic field and coherent radiation such as that from a laser. Separation of isotopes by isotopically selective ionization, followed by entrainment of the ions by means of a magnetic field, is known. The selective ionization operation can be carried out in two consecutive stages: excitation of the chosen isotope, from the ground energy state to a specified excited level, near ionization; the energy required for this first stage can be supplied by means of a laser, the laser radiation being characterized for high power and well-defined frequency; this stage offers the advantage of being easily made isotopically selective; then ionization of the excited atoms by means of supplying relatively weak energy which should be insufficient to ionize the nonexcited ions; this second stage can also be carried out by means of a laser.

1924 **(UCRL-Trans—11923) Process for isotope separation.** Emile, B.F.M. (Lawrence Livermore National Lab., CA (USA)). Nov 1983. Contract W-7405-ENG-48. Translation of French Patent Application No. 74 21387. 30p. NTIS, PC A03/MF A01. Order Number DE84001983.

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A process is claimed for isotopic separation applied to isotopes of elements that can be placed in at least a physicochemical form in which the isotopic atoms or the molecules containing these atoms can be easily displaced and for which there are selective radiations preferentially absorbed by the isotopes of a certain type or by the molecules containing them, said absorption substantially increasing the probability of ionization of said atoms or molecules relative to the atoms or molecules that did not absorb the radiation. The process consists of placing the isotopic mixture in such a form, subjecting it in a separation zone to selective radiations and to an electrical field that produces migration of positive ions toward the negative electrodes and negative ions toward the positive electrodes, and withdrawing from certain such zones the fractions thus enriched in certain isotopes.

1925 **Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. II. Theory.** Wagner, A.F. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Applied Physics;* **54**: No. 4, 1755-1780(Apr 1983). Contract W-31-109-ENG-38.

The behavior of a flowing $Cs^+$-$UF^-_6$ ion-pair plasma in the radiofrequency (rf) quadrupole-dipole fields of a mass filter has been studied theoretically. The theoretical calculations were designed to simulate the experimental observations of the preceding paper. For low-density plasmas, the calculations involved trajectory studies of isolated ions in quadrupole-dipole fields with or without fringe fields. For high-density plasmas, two-dimensional particle-in-cell trajectory studies were used to self-consistently incorporate space-charge effects into the simulated plasma behavior in perfect quadrupole-dipole fields uncomplicated by fringe fields. Three aspects of the interaction of the plasma with the radiofrequency fields were investigated: (1) the effects of fringe fields, especially on the injection of the plasma into the quadrupole-dipole field, (2) confinement by and transmission of the flowing plasma through a quadrupole field, and (3) mass-sensitive ejection of ions from the plasma by superimposed quadrupole and dipole fields. For each of these three topics, the theoretical results were compared to the experimental observations. In general, the agreement between theory and experiment is good. The theoretical calculations suggest a limiting current of several hundred microamperes that can be transmitted by the mass filter. The limit is reached when the plasma density increases to the level where the plasma frequency is comparable to the applied rf quadrupole frequency. At higher densities, successive layers of the plasma peel off and are driven out by the applied field until the limiting density is reached.

1926 **(UCRL-Trans—11922) Process for separation of isotopes from a gaseous mixture.** Clerc, M.; Rigny, P.; Chatelet, J.; Coste, A. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. Translation of French Patent Application No. 76 28725. 19p. NTIS, PC A02/MF A01. Order Number DE84002621.

The present invention concerns a process for separation of isotopes from a gaseous mixture that permits the indicated isotopic separation by the combined action of photon irradiation by laser light, followed by Penning ionization of atoms, ions or molecules excited by the laser light in selective fashion.

## 0507 Fuels Production And Properties

*REFER ALSO TO CITATION(S) 2784*

1927 **(AEEW-R—1588) Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis.** Knight, A.P. (UKAEA Atomic Energy Establishment, Winfrith). Jun 1982. 37p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704292.

This report describes the application of the Isomass 54E Thermal ionisation mass spectrometer for the isotopic analysis of plutonium, and gives details of the development of a method for quantitative determination of plutonium in sample solutions using isotopic dilution. A computer program for the control of the 54E is also described. Isotope dilution was used to compare results of plutonium content of twelve zebra reactor fuel pellets with results obtained by titrimetry. The Isomass 54E is shown to be capable of high precision analysis of plutonium sample solutions for both isotopic content and total plutonium concentration using an isotope dilution technique.

1928 **(HEDL-TME—83-28) Characteristics of spent LWR fuel relevant to its storage in geologic repositories.** Woodley, R.E. (Hanford Engineering Development Lab., Richland, WA (USA)). Oct 1983. Contract AC06-76FF02170. 56p. NTIS, PC A04/MF A01. Order Number DE84002957.

Data on spent LWR fuel are summarized. Fuel rod cladding integrity and conditions within fuel rods established during reactor residence as they affect storage in geologic repositories are emphasized.

1929 **(INIS-mf—8547) Report of consultants to the IAEA on requirements for the safe transport of low hazard radioactive materials.** Collin, W.; Grenier, M.; Hopkins, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 90p. (CONF-8209134—30). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703606.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

In the present paper changes are recommmended to certain definitions given in the 2nd draft revision of the IAEA 'regulations for the safe transport of radioactive materials (safety series no. 6)'.

1930 **(Juel—1835) Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons.** Schilling, T. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Technische Hochschule Aachen (Germany, F.R.)). Mar 1983. 67p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751359.

In case of an enhanced utilisation of nuclear energy from fission reactors it is necessary to preserve the natural deposits of fissile material. One possibility for this preservation could be the breeding of synthetic fuel by the means of spallation neutrons. The configuration discussed here consists of an integral spallation target/breeding blanket pebble bed of hollow thorium spheres, which is cooled alternatively with helium gas or liquid sodium or lithium. With helium cooling the neutron yield is 35 neutrons par initial proton and the breeding gain is 775 kg U-233/a. With sodium as coolant the n-yields is 25 n/p, and the fuel production is 520 kg U-233/a. If liquid lithium is used as coolant the neutron yield is 30 n/p with a production of 440 kg Uranium-233 per year. Supposing a fuel requirement of a high converting HTR of 90 kg U-233/GW-a, 5 to 9 1-GWsub(e)-reactors could be supplied depending on the coolant.

1931 **Consistency in thermophysical properties: enthalpy, heat capacity, thermal conductivity and thermal diffusivity of solid $UO_2$.** Fink, J.K.; Chasanov, M.G.; Leibowitz, L. (Argonne National Lab., IL). pp 215-222 of Proceedings of the eighth symposium on thermophysical properties. Volume II: thermophysical properties of solids and of selected fluids for energy technology. Sengers, J.V. (ed.). New York, NY; The American Society of Mechanical Engineers ([nd]).

Equations have been derived for the enthalpy, heat capacity, thermal conductivity, and thermal diffusivity of $UO_2$. In selection of these equations, we considered the traditional criterion of lowest relative standard deviation between experimental data and the function chosen to fit these data as well as consistency between the thermophysical properties. In the latter case, we considered consistency in (1) thermodynamic relations among properties, (2) the choice of physical phenomena on which to base the theoretical formulation of the equations, and (3) the existence and temperature of phase transitions.

1932 **Thermophysical properties of reactor fuels.** Leibowitz, L. (Argonne National Lab., IL). pp 185-192 of Proceedings of the eighth symposium on thermophysical properties, Volume II: thermophysical properties of solids and of selected fluids for energy technology. Sengers, J.V. (ed.). New York, NY; The American Society of Mechanical Engineers ([nd]).

Reactor safety analysis involves, in part, the use of large computer codes to follow the course and consequences of hypothetical nuclear reactor accidents. As part of the input to these codes, knowledge of the thermophysical properties of reactor materials to very high temperatures is required. In many casis, the data needed are neither available in the literature nor readily determinable by conventional experimental means. As a result, long extrapolations, estimates, and theoretical calculations are presently being used to supply the needed information. Among the more important of the properties needed are the vapor pressure and heat capacity of reactor fuel. In this paper, a review is presented of the literature on the enthalpy of uranium, thorium, and plutonium oxides and an approach is described for calculating the vapor pressure and gaseous composition of reactor fuel. In these calculations, thermodynamic functions of gas-phase molecular species (studied with matrix-isolation spectroscopy) are employed in conjunction with condensed-phase thermodynamics. A summary is presented of the status of this work.

## 0508 Spent Fuels Reprocessing

*REFER ALSO TO CITATION(S) 1962, 1994, 2886*

1933 **(HEDL-SA—2874) Determination of xenon in irradiated nuclear fuel using a shielded electron microprobe.** Jenson, E.D. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1983. Contract AC06-76FF02170. 17p. (CONF-830815—11). NTIS, PC A02/MF A01. Order Number DE84001486.

From 18. annual Microbeam Analysis Society conference; Phoenix, AZ, USA (8 Aug 1983).

The technique described produces a semi-quantitative determination of the distribution of xenon present in a section of fuel pin along a predetermined line. The x-ray counting technique chosen is to drive the spectrometer over the peak in small increments, counting at each step, then to integrate the resulting data over the entire peak. Counting times are usually 10 sec at each step and there are 30 to 40 steps over a peak. Interferences and possible loss of Xe due to local heating are discussed. Comparison with independent analysis is presented.

1934 (ORNL—5933, pp 50-74) **Basic science and technology.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

Research is reported on separations science, chemistry of actinide and fission products, chemical engineering research, fundamental processes in sorption pumping and transfer operations, resource recovery, actinide oxides and carbides, and fusion energy studies. .

1935 (ORNL—5933, pp 114-117) **Miscellaneous programs.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

Miscellaneous program studies included: conversion of Consolidated Edison uranium from a nitrate solution to $U_3O_8$; $^{233}U$ processing; post accident sampling in nuclear reactors; and solubilization of uranium from each residues.

1936 **(RFP—3511) Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982.** Miner, F.J. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 16 Sep 1983. Contract AC04-76DP03533. 93p. NTIS, PC A05/MF A01. Order Number DE84002475.

Progress is reported by the groups of Product Integrity and Surveillance (plutonium), Chemical Research, Process Chemistry Development, and Process Chemistry Support. (DLC)

1937 **(RHO-PB-SR—10-B-CP-Sept.83) Chemical processing monthly report.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Sep 1983. Contract AC06-77RL01030. 62p. NTIS, PC A04/MF A01. Order Number DE84001905.

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PUREX operations concentrated on activities required to successfully conduct enhanced readiness testing and systems necessary for hot operations. A large number of startup upgrades were completed. PUREX head end decladding and dissolution tests were completed in B and C cells using unirradiated fuel. Major PFM milestones completed this report period were (1) Interim Fuel Dissolution Report issued; (2) Dissolver Solution Clarification Test completed; (3) General user requirements for Process Control System developed; (4) Conceptual Design for Fuel Transport System completed; and (5) Iodine Removal Engineering Report issued. Construction on Project B-246, Vault Support Facility, was completed on schedule. Roof upgrades at T-Plant and Plutonium Finishing Plant were completed on schedule.

1938 **(ORNL-tr—5043) Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN.** Fischer, U.; Wiese, H.W. (Oak Ridge National Lab., TN (USA); Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). 1983. Contract W-7405-ENG-26. Translation of KFK 3014, January 1983. 246p. NTIS, PC A11/MF A01. Order Number DE84002355.

For safe handling, processing and storage of spent nuclear fuel, a reliable experimentally validated method is needed for calculating the composition of the irradiated fuel, its radioactivity and heat release, and the emitted radiation. A cell-burnup method was developed for pressurized water reactors which makes it possible to determine the nuclear inventory, taking into account reactor-specific characteristics such as cell geometry, initial enrichment, and reactor control. Routine calculations can be performed using the burnup and decay program KORIGEN with reactor-specific sets of cross sections from the cell-burnup procedure - burnup-dependent for actinides on the basis of recent Karlsruhe data. The method is validated by numerous comparisons between calculations and measurements. A description of the input along with examples is included for applications using KORIGEN. Improvements with respect to ORIGEN as regards procedure and data are described, and results of KORIGEN, ORIGEN and ORIGEN2 calculations are compared with one another. Fuel and waste inventories are given for BIBLIS-type fuel of different burnups.

1939 **Comments on the note by L.S. Nelson: "unusually high (oxidizer/Pu) ratios in the macro-residues from plutonium droplet combustion".** Allen, M.D.; Morgan, L.G. (Pacific Northwest Lab., Richland, WA). *High Temperature Science;* **15**: No. 4, 321-326(Dec 1982). Contract AC06-76RL01830.

An alternative explanation for unusually high ratios of oxidizers/plutonium in the residues from plutonium droplet combustion is offered in response to a note by L.S. Nelson. Two additional experiments are suggested that would be helpful in clarifying the high oxidizer/Pu ratios. The first would be to measure the true surface area for a spherule after its explosion. The second is an experiment analogous to a gas analysis experiment. The conclusion is put forth that adsorbed gases are the most likely cause of the high O/M ratios described by Nelson.

1940 **Reply to the comments by M.D. Allen and L.G. Morgan.** Nelson, L.S. (Sandia Labs., Albuquerque, NM). *High Temperature Science;* **15**: No. 4, 327-329(Dec 1982). Contract AC04-76DP00789.

Nelson responds to the aternative explanation offered by Allen and Morgan for the high ratios of oxidizer/Pu ratios in residues from plutonium droplet combustion.

1941 **Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing.** Altmann, J.; Bautz, P.; Boeing, H.; Buerkmann, K.; Carius, R.; Finger, F.; Hahn, R.; Heybrock, G.; Hirsch, H.; Lewe, P. (Naturwissenschaftlergruppe NG 350, Marburg (Germany, F.R.); Gruppe Oekologie, Hannover (Germany, F.R.)). Hannover, Germany, F.R.,; Gruppe Oekologie (1982). 368p. (In German). Gruppe Oekologie, Hannover (Germany, F.R.).

Volume 1 deals with the following subjects: 1. The policy of radioactive waste management in the Federal Republic of Germany and alternatives of reprocessing. 2. International experience with the reprocessing of nuclear fuels. For the German-speaking area this is so far the most comprehensive representation of the international experience with reprocessing. The "terrifyingly negative" experience gathered here makes already plain why critics of the nuclear technology have so little confidence in the harmlessness of the reprocessing plants planned in the Federal Republic of Germany. 3. Radioecology: This chapter reports the injuries to health caused by a reprocessing plant as well as the official calculations for determination of the population exposure. 4. Energy supply and energy policy: The present energy policy of the Federal Republic of Germany is critically examined. Special attention is paid to the position of reprocessing plants in future energy supply scenarios. (orig.).

## 0509 Transport And Storage

*REFER ALSO TO CITATION(S) 1932, 3067*

1942 **(INIS-mf—8550) Different types of intermediate storages.** Spilker, H. (Deutsche Gesellschaft fuer Wiederaufarbeitung von Kernbrennstoffen m.b.H. (DWK), Hannover (Germany, F.R.)). (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 30p. (CONF-8209134—28). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703604.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Spent nuclear fuel elements require a period of "cooling" after withdrawal from a nuclear reactor. This is done in water storage pools located at the reactor facility. The minimum storage time prior to subsequent operations with the spent fuel is recognized as six to twelve months. After the initial storage period for cooling, the subsequent storage time in water pools could vary from a few years to several decades. Up to 1980, about 15.700 MTHM of spent LWR and HWR fuel have been discharged from nuclear stations. Since only a small fraction thereof has been already reprocessed, the spent fuel assemblies are stored at the reactor-side (AR) in reactor basins in normal or compact racks and away from reactor (AFR) in water pool storages awaiting either reprocessing or final disposal depending on the fuel cycle concept chosen by the individual countries.

1943 **(INIS-mf—8609) Radioactive Ores and Concentrates (Packaging and Transport) Act 1980, No. 26 of 1980.** (Northern Territory of Australia). 14 Mar 1980. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704424.

This Act, which regulates the packaging, storage and transport of radioactive ores and concentrates lays down a detailed licensing system for such materials and prescribes the duties of the Chief Inspector responsible for implementation of the Act. (NEA).

1944 **(SAND—83-0866C) Regulation versus reality.** Jefferson, R.M.; McClure, J.D. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-8309182—1). NTIS, PC A02/MF A01. Order Number DE84000044.

From PATRAM '83; New Orleans, LA, USA (27 Sep 1983).

Regulations for the transport of radioactive material are considered. Qualification criteria specified in the regulations, when applied to packaging design, provide the objective of safe packaging and transport of nuclear materials. Incorporation of accident statistics, accident damage reports, mathematical analysis, and physical test have enabled researchers to determine the relationship between regulations and the real world. Between 1971 and 1981 of the almost 123,000 hazardous materials incident reports filed with the US Department of Transportation and the US NRC, only about 0.5% of these involve radioactive materials. Sixty-one of 1134 accidents involving Type A packaging involved release of radioactive. Of 51 accidents involving Type B packagings no releases occurred.

## 0510 Marketing And Economics

*REFER ALSO TO CITATION(S) 1905*

## 0520 Waste Management

*REFER ALSO TO CITATION(S) 2043, 2045, 2046, 2048, 2049, 2255, 2288, 2306, 2440, 2788, 2870, 2907, 3287, 3288, 3290, 3291, 3292, 3293, 3294, 3295, 3328, 3332, 3388, 3435*

1945 **(AERE-G—2599) Electrical processes for the treatment of medium-active liquid wastes. Annual progress report, January-December 1982.** Turner, A.D.; Bowen, W.R.; Bridger, N.J.; Harrison, K.T. (UKAEA Atomic Energy Research Establishment, Harwell. Materials Development Div.). Feb 1983. 7p. (DOE-RW—83.013). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703804.

(1) Electro-osmosis: a wide range of sludges, flocs and colloids have been successfully dewatered. For a genuine site waste, virtually complete retention of $\alpha$ and Co was observed. A retention of 55% of Cs was measured. A DF of $>$ 300 was obtained for a colloidal suspension of $Ti(OH)_4$ containing $^{85}Sr$. (2) Electrochemical Ion-Exchange: electrochemical control of ion-exchange extends the normal capabilities of the exchanger:- more rapid adsorption kinetics, wider operating pH range, lower equilibrium free concentration, and elution by current reversal. Commercially available weak acid cation exchangers and electrochemically activated carbon have been successfully demonstrated using $^{137}Cs$. (3) Faradaic Deposition: the deposition of insoluble actinide hydroxides at cathodes by electrochemical reduction of $NO_3^-$ has a low efficiency at pH $<$ 1.5. The most adherent U deposits were obtained at concentrations $<=$ 0.1 mM. Metallic Ru could not be cathodically deposited from $HNO_3$ solution due to the stability of the $(RuNO)^{3+}$ complex. However, $RuO_2$ could be precipitated under more alkaline conditions by anodic oxidation. Deposition of Cs, Sr into mercury cathodes becomes increasingly inefficient in acid solutions due to hydrogen evolution, and in alkaline solutions due to poor selectivity of removal from high Na content streams.

1946 **(CONF-8209134—Absts.) Experience with the storage of high active waste at WAK.** Wiese, H.; Schulte, B. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 20p. Available from Fachinformationszentrum fuer Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

The WAK, a reprocessing plant located in the northern part of the Nuclear Research Center, Karlsruhe, is a pilot plant for reprocessing irradiated fuels, the throughput being about 35 tons of uranium per year. The maximum enrichment is 3.1% U-235 and the chemical reprocessing is carried out using the worldwide well known Purex method. Since the facility first operated in September 1971, fuel elements from 6 light and heavy water reactors containing 177 tons uranium and 540 kg plutonium have been reprocessed in the Karlsruhe reprocessing plant, WAK. In this way, a large amount of highly irradiated fuel elements from light water reactors with average burn-up rates of 30,000 and maximum rates of 39,000 Mwd/t uranium were processed.

1947 (DOE/ID—12098, pp 14-20) **Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area.** Reynolds, T.D.; Arthur, W.J. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

As part of a larger study on the effects of biological intrusion of plants and animals into the soil cover placed over low-level radioactive wastes stored at the Idaho National Engineering Laboratory Subsurface Disposal Area (SDA), research was initiated in the summer of 1982 to determine the burrow characteristics and movement patterns of several small mammal species, and the rooting depths of various plants. The depth, length, and volume of burrows were determined for four small mammal species: deer mouse (Peromyscus maniculatus), Ord's kangaroo rat (Dipodomys ordii), montane vole (Microtus montanus), and Townsend's ground squirrel (Spermophilis townsendii). The latter species excavated the greatest mean burrow depth (39 cm), length (404 cm), and volume (14.8 l). Movement patterns of three species were determined by radiotelemetry. The mean area of use for P. maniculatus, D. ordii, and M. montanus was 2.3, 1.5, and 1.2 ha respectively. Limited data on rooting depths of various native and introduced plant species at the SDA were obtained by literature review and excavation. During FY-83, experiments will be conducted, using the information obtained from the first year of this study, to evaluate the impact of burrowing mammals and root intrusion on the integrity of the soil cover currently existing at the SDA. Details of these experimental studies are presented.

1948 **(DP-MS—83-107) High-level waste description, inventory and hazard.** Crandall, J.; Hennelly, E.J.; McElroy, J.L. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.; Pacific Northwest Lab., Richland, WA (USA)). 1983. Contract AC09-76SR00001. 26p. (CONF-831063—5). NTIS, PC A03/MF A01. Order Number DE84002429.

From American Institute of Chemical Engineers fall annual meeting; Washington, DC, USA (30 Oct 1983).

High-level nuclear waste (HLW), including its origin, is described and the current differences in definitions discussed. Quantities of defense and commercial radioactive HLW, both volume and curie content, are given. Current waste handling, which is interimin nature, is described for the several sites. The HLW hazard is defined by the times during which various radionuclides are the dominant contributors. The hazard is also compared to that of the ore. Using ICRP-2, which is the legal reference in the US, the hazard of the waste reduces to a level equal to the ore in about 300 years. The disposal plans are summarized and it is shown that regulatory requirements will probably govern disposal operations in such a conservative manner that the risk (product of hazard times probability of release) may well be lower than for any other wastes in existence or perhaps lower than those for any other human endeavor.

1949 **(EGG-M—12383) Selecting host states for low-level waste-disposal sites.** Romano, S.A.; Levin, G.B. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 5p. (CONF-831047—105). NTIS, PC A02/MF A01. Order Number DE84002220.

From American Nuclear Society winter meeting; San Francisco, CA, USA (30 Oct 1983).

In December 1980, Congress enacted the Low-Level Radioactive Waste Policy Act (P.L. 96-573), assigning state governments the responsibility to provide for safe and efficient low-level waste disposal. The law encourages cooperation among states in meeting this responsibility, and allows congressionally approved interstate compacts to restrict use of regional disposal sites to member states only after 1986. Six compacts covering the Northwest, Rocky Mountain, Central States, Southeast, Midwest, and Northeast regions have been negotiated. Each of the six compacts incorporate the 1986 exclusion provision. California and Texas are the only states proceeding individually. Establishment of new land disposal sites remains the critical measure of success. Identifying host states for new sites is the critical next step. A framework for a host state selection process is outlined.

1950 **(EGG-M—13283) Economics of low-level radioactive waste disposal.** Schafer, J.; Jennrich, E. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 9p. (CONF-831047—104). NTIS, PC A02/MF A01. Order Number DE84002219.

From American Nuclear Society winter meeting; San Francisco, CA, USA (30 Oct 1983).

Regardless of who develops new low-level radioactive waste disposal sites or when, economics will play a role. To assist in this area the Department of Energy's Low-Level Radioactive Waste Management Program has developed a computer program, LLWECON, and data base for projecting disposal site costs. This program and its non-site specific data base can currently be used to compare the costs associated with various disposal site development, financing, and operating scenarios. As site specific costs and requirements are refined LLWECON will be able to calculate exact life cycle costs for each facility. While designed around shallow land burial, as practiced today, LLWECON is flexible and the input parameters

discrete enough to be applicable to other disposal options. What the program can do is illustrated.

1951 **(EUR—7338) Acid digestion of Pu-containing waste. Process development and Pu-recovery.** Wieczorek, H.; Kemmler, G.; Muhr, G.; Plessing, J.; Stojanik, B. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 80p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703805.

Work is presented on the cold demontration of the method. The results of accompanying R+D activities and of work on plutonium recycling are described. On the basis of results provided by HEDL and precious R+D work performed at the Karlsruhe Nuclear Research Center an inactive experimental facility had been developed for a waste throughput of 1.5 kg/h. Its main components are the reactor (tray or ring reactor), the off-gas cleaning system, the acid recycling system and the filter tray. The experimental facility was run in trial operation together with the tray reactor from June to December 1979 and has operated since December 1979 together with the ring reactor. Besides simulated plutonium bearing waste other burnable wastes such as ion exchange resins have been treated successfully. The acid gases $SO_2$, NOsub(x) and HCl produced are separated with the exception of HCl by oxidizing these gases with air and $H_2O_2$ into acid anhydrides followed by hydration and scrubbing with a scrubbing solution. The acids formed during off-gas treatment ($H_2SO_4$, $HNO_3$ and HCl) are distilled and the total sulfuric acid used as well as more than 70% of the nitric acid are returned into the process. Separation of residues from the reactor acid takes place by pressure filtration. By leaching the solid suspension residue with four times the volume of 0.1 M $H_2SO_4$ during the first leaching step and with twice the volume each in the second and third leaching steps complete leaching of the plutonium sulphate formed is achieved.

1952 **(EUR—7371) Fabrication of high activity glasses in the cells VULCAIN and PIVER. Leaching at three temperatures of some of these glasses in the VULCAIN cell.** Jacquet-Francillon, N.; Laude, F.; Magnier, A.; Vernaz, E. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 58p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703806.

The methods for manufacturing and leaching four blocks of glass and one of vitreous ceramic made as from actual solutions of fission products in the Vulcain cell are described. The four blocks of glass and the vitreous ceramic are in lumps weighing from 1.6 to 1.9 kg. The volatilities measured during the making of these blocks of glass by a pot (intermittent) method and expressed as a percentage of the total activity trapped in the condenser vary from 30.7 to 9.4 for ruthenium. In the case of cesium, strontium and cerium, the volatilization rates are between 0.01 and 0.5%. The behaviour under leaching of the vitreous ceramic is less good than its mother glass. The increase in leaching rates with temperature differs from one glass to the next and according to the components.

1953 **(EUR—7650) R and D program concerning radioactive waste disposal in deep geologic formation (Study of an argilaceous formation in Belgium). Summary of works carried out in the years 1975-1979.** (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 135p. (In French). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703810.

In 1974 it was decided to start up research with a view to safe disposal of conditioned waste in geological formations in Belgium. A first R and D programme was set up for study of the Boom clay in the Mol region. Multiple research projects have been undertaken; both experimental research in the field and in the laboratory and theoretical studies. Different exploratory drillings for geohydrological and geotechnical research were performed at the potential site. Teledetection and seismic prospection campaigns have provided data on the dimensions of the argillaceous layer and on the absence of major faults. Clay samples collected during drilling campaigns have been submitted to a number of analyses in laboratory as well as analyses of possible interactions between the clay and the conditioned waste to be stored. Some of these laboratory analyses, in particular, those concerning heat transfer and corrosion have been completed by more representative experiments in a clay pit. Various mathematical models have been developed and adapted with a view to better understanding of physical and physico-chemical phenomena like heat transfer, migration and retardation of radionuclides. A feasibility study was performed. Concerning safety analyses, a probabilistic study was undertaken on the behaviour of the geological barrier. The fault tree analysis technique was applied and the study was carried out in close collaboration with the Joint Rsearch Centre in Ispra. The underground experimental room at about 220 m depth was not yet relised but the technico-economical dossier has made such progress that the excavation can start in the very beginning of the next five-year programme.

1954 **(EUR—7654) Solidification of alpha-bearing wastes in ceramic.** Kartes, H.; Riege, U.; Goertzen, A.; Dippel, T. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 87p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703807.

This report gives a survey over the results and experiences with the solidification of $\alpha$-bearing wastes in ceramic. The underlying principle of the process and the lab-scale installation for the solidification of $\alpha$-bearing wastes are described in detail. 50 litres $\alpha$-concentrates from the $UO_2/PuO_2$-fuel fabrication and 1 kg ashes from the incineration of $\alpha$-bearing wastes were solidified. Furthermore the $\alpha$-doted simulates of dissolver residues, wet combustion residues and MLW-sludges were solidified in ceramic. In total 20 kg of waste-ceramic product, containing 90 Ci $\alpha$ and 450 Ci $\beta,\gamma$ were produced. The resistance to compression, the radiation stability and the leach behaviour of the products were determined. The different waste products have shown a leach rate for Pu of $10^{-6}$ to $10^{-8}$ ($g/cm^{-2}\ d^{-1}$) for distilled water and saturated salt brine at room temperature.

1955 **(EUR—7675) High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium.** Voorde, N. van de; Claes, J.; Taeymans, A.; Hennart, D.; Gijbels, J.; Balleux, W.; Geenen, G.; Vangeel, J. (Commission of the European Communities, Luxembourg). 1982. 132p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703808.

The incineration system of radioactive waste discussed in this report, is an "integral" system, which directly transforms a definite mixture of burnable and unburnable radioactive waste in a final product with a sufficient insolubility to be safely disposed of. At the same time, a significant volume reduction occurs by this treatment. The essential part of the system is a high temperature incinerator. The construction of this oven started in 1974, and while different tests with simulated inactive or very low-level active waste were carried out, the whole system was progressively and continuously extended and adapted, ending finally in an installation with completely remote control, enclosed in an alpha-tight room. In this report, a whole description of the plant and of its auxiliary installations will be given; then the already gained experimental results will be summarized. Finally, the planning for industrial operation will be briefly outlined. An extended test with radioactive waste, which was carried out in March 1981, will be discussed in the appendix.

1956 **(EUR—7728) Processing of irradiated fuel cans by rolling and embedding in concrete (Final report Nov 1976-Jul 1980).** Frotscher, H.; Graebner, H.; Kapulla, H. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 172p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83703811.

A rolling process was developed to compress scrap materials from a reprocessing plant. A concrete matrix was selected for the fixation. An increase of density of the rolled and jigged model cladelements by a factor of 2.5 was demonstrated in a small inactive pilot plant. The immobilisation of radioactivity by concrete, packed in 330-l-drums and 400-l-RRF, as outer shell, corresponds the present DKW-concept. A qualitative and quantitative characterisa-

tion of these disposal assemblies of compacted waste is given and compared with non-compacted waste. Complementary studies were carried out to determine the retention of tritium, the gas production by radiolysis leaching and thermal conductivity. The retention of hydrogen is low in concrete.

1957 (IAEA-SR—72, pp 516-535) **Testing of the filtration efficiency of a silica gel packing for capture of cesium aerosol.** Kepak, F.; Kanka, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)); Zahnas, L. (Energoprojekt, Prague (Czechoslovakia)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/37).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The filtration of cesium aerosol that is formed during melting model high-level radioactive wastes was studied. The silica gel packing was used as a filter. Necessary filtration characteristics (dependence of filtration on gas velocity, temperature, grain size and others) were determined to find the optimum conditions for the filtration of cesium aerosol.

1958 (IAEA-SR—72, pp 625-638) **Demister apparatus for gaseous wastes carrying radioactive aerosols.** Meline, F.G.; Richter, R.J. (Societe Generale pour les Techniques Nouvelles S.G.N., 78 - Saint-Quentin-en-Yvelines (France)). May 1983. (In French). NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/12).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

In the nuclear industry, more precisely in the field of spent fuel reprocessing, the cleaning of the gaseous wastes, before evacuation, should be realized with a device designed in order to take full account of the constraints that are inherent in the radioactive media. The French Atomic Authority (CEA), in collaboration with the Societe Generale pour les Techniques Nouvelles, have studied and developed types of demister for the nuclear field having good cleaning properties.

1959 (IAEA-SR—72, pp 536-591) **Design and operational experience with the off-gas cleaning system of the Seibersdorf incinerator plant.** Patek, P.R.M. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H. Hauptabteilung Abfallverarbeitung). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/1).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

After a description of the design and the construction principles of the incinerator building, the furnace and its attached auxiliary devices are explained. The incinerator is layed out for low level wastes. It has a vertical furnace, operates with discontinuous feeding for trashes with heat-values between 600 and 10,000 kcal/kg waste. The maximum throughput amounts to 40 kg/h. The purification of the off-gas is guaranteed by a multistage filter system: 2 stages with ceramic candles, an electrostatic filter and a HEPA-filter system. The control of the off-gas cleaning is carried out by a stack instrumentation, consisting of an aerosol-, gas-, iodine- and tritium-monitor; the building is surveyed by doserate and aerosolmonitors. Finally the experiences of the first year of operation and the main problems in running the plant are described.

1960 (IAEA-SR—72, pp 639-659) **Volatilization and trapping of ruthenium during calcination of nitric acid solutions.** Klein, M.; Weyers, C.; Goossens, W.R.A.; Smet, M. de; Trine, J. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/3).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Solid radioactive aerosols and semi-volatile fission products e.g. Ru, Cs, Sb are generated during high level liquid waste calcination and vitrification processes. The retention of Ruthenium was studied because of its strong tendency to form volatile compounds in oxidative media. Since $RuO_4$ was the suspected form for high temperature processes, the study was carried out on the behaviour of $RuO_4$ and its retention on adsorbants and catalysts for various gas compositions. The behaviour of volatilized Ru species obtained by calcination of nitrosyl Ru compounds was then compared with the $RuO_4$ case.

1961 (IAEA-SR—72, pp 660-661) **Off-gas treatment for HLLW-vitrification techniques using a liquid-fed ceramic waste glass melter.** Weisenburger, S.; Roth, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Entsorgungstechnik). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/18).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

1962 **(IAEA-SR—72) Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruhe, Germany, F.R., 3-7 May 1982.** (International Atomic Energy Agency, Vienna (Austria)). May 1983. 669p. (IAEA-SR—72/34; CONF-8205206—). NTIS (US Sales Only), PC A99/MF A01. Order Number DE84780010.

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Separate abstracts were prepared for individual papers.

1963 **(INIS-mf—8458) Treatment of concentrated waste for storage - fixation of concentrated gaseous waste.** Penzhorn, R.D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 10p. (CONF-8209134—20). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703327.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Among the gaseous primary radioactive isotopes that may require recovery, immobilization and storage, one has to consider $^{3}H$ (tsub(1/2)=12,32 a) and $^{85}Kr$ (tsub(1/2)=10,76 a). In this paper the most promising immobilization alternatives developed so far for these radio nuclides are discussed.

1964 **(INIS-mf—8460) International regulations for radiation protection.** Daw, H.T. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 25p. (CONF-8209134—21). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703334.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

A review of the development of the IAEA Radiological Protection standards is given. The basic features of the latest revision recently adopted by the governing bodies of the sponsoring organizations, i.e. IAEA, WHO, ILO, NEA/OECD are discussed and some of the features of the future Agency programme for its implementation will be outlined. In particular, attention will be given to development of the basic principles for setting release limits of radioactive materials into the environment. An important aspect of this is when the release of radioactive materials into the environment crosses international boundaries. The Agency is best suited to try to reach a consensus on the minimum monetary value for the unit collective dose.

1965 **(INIS-mf—8462) Technical, environmental and regulatory aspects of waste management and their reflection in the IAEA programme.** Richter, D.K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 47p. (CONF-8209134—22). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703335.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Within the IAEA training course on waste management this paper is intended to overview technological, radiological, enciromental, regulatory and institutional aspects of importance in estab-

lishing a waste management policy for nuclear power programmes; the objectives and results of IAEA activities in this field; and some current issues from a national and international perspective with special consideration on the needs of countries embarking on nuclear power.

1966 (INIS-mf—8463) **Introduction - types and quantitites of nuclear waste - principles of waste management.** Krause, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 9p. (CONF-8209134—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703325.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

In all areas of the nuclear technology and the application of radioisotopes radioactive wastes are generated. The largest amounts arise in nuclear power plants. The radionuclides contained in these wastes, however, have only relatively short half-lifes as a rule. The highest activities are contained in the wastes from the reprocessing of spent nuclear fuels. Most of these wastes as well as the wastes arising from the fabrication of mixed oxide fuels contain actinides. The amounts and activities of the wastes arising from isotope application are in general small compared to those from the nuclear fuel cycle. Wastes with short-lifed radionuclides need only collection and storage until sufficient decay. Dispersion in the environment is frequently applied for noble gases and tritium. The most frequently applied principle in radioactive waste management, however, is concentration and isolation. Several methods are available for this purpose and will be outlined in the lecture. Mechanical filtration and absorption are often applied for the treatment of exhaust air and off-gases. Liquid effluents are mostly cleaning by evaporation, ion exchange of flocculation prior to re-use or discharge. The resulting residues are unmobilized. Solid wastes can be reduced in volume by incineration or baling. For the long-term isolation (disposal) of the conditioned wastes ground disposal, sea dumping and disposal into deep geological formations are available. Their application depends to some degree on the local conditions and the activity level. The radioactive wastes must meet certain criteria for being suitable to disposal.

1967 (INIS-mf—8470) **Handling and storage of high-level liquid wastes from reprocessing of spent fuel.** Finsterwalder, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 33p. (CONF-8209134—6). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703326.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

The high level liquid wastes arise from the reprocessing of irradiated nuclear fuels, which are dissolved in aqueous acid solution, and the plutonium and unburned uranium removed in the chemical separation plant. The remaining solution, containing more than 99% of the dissolved fission products, together with impurities from cladding materials, corrosion products, traces of unseparated plutonium and uranium and most of the transuranic elements, constitutes the high-level waste. At present, these liquid wastes are usually concentrated by evaporation and stored as an aqueous nitric acid solution in high-integrity stainless-steel tanks. There is now world-wide agreement that, for the long term, these liquid wastes should be converted to solid form and much work is in progress to develop techniques for the solidification of these wastes. This paper considers the design requirements for such facilities and the experience gained during nearly 30 years of operation.

1968 (INIS-mf—8473, pp 323-327) **Air monitoring requirements and alarm response procedures in reprocessing plants.** Coates, R. (British Nuclear Fuels Ltd., Sellafield). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A comprehensive air monitoring programme will need to consider the requirement to sample for alpha and/or beta particulate activity, volatile species activity (e.g. iodine) and radioactive gas (eg tritium or krypton). This paper reviews the philosophy and requirements of the air monitoring programme for the reprocessing plant at BNFL's Sellafield site (formerly known as Windscale and Calder Works), with particular emphasis on particulate activity sampling systems.

1969 (INIS-mf—8473, pp 363-369) **Development of a batch process for immobilizing some CRNL radioactive waste in glass.** Burrill, K.A. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Bench scale and pilot plant experiments have been carried out over the past two years to re-acquire experience in immobilizing radioactive wastes in glass. A particular objective is to develop a process for a plant at Chalk River Nuclear Laboratories (CRNL) to immobilize radionuclides in the 19 $m^3$ of aged acidic waste solution presently in storage and in fresh waste coming from Mo-99 production. Sodium borosilicate glasses have been made in crucibles, and wastes such as incinerator ash, ion-exchange regeneration solutions ($Na_2SO_4$), and the CRNL acidic wastes have been put into the glasses successfully. Phosphate glasses have also been explored as possible matrices for such wastes. A pilot plant, based on 5 and 15 cm diameter x 80 cm long 304 L stainless steel canisters, has been operated to define the steps necessary to produce waste glasses batchwise on a larger scale. Results from the pilot plant have led to a flowsheet proposed for a CRNL waste glass plant.

1970 (INIS-mf—8473, pp 386-391) **Photochemical abatement of radioactive iodines.** Vickis, A.C.; Furst, D.A. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A photochemical method for the removal of radioactive iodines ($^{129}I$ and $^{131}I$) from the off-gas streams of nuclear facilities is presented. The method uses ultraviolet radiation (lambda=200-300 nm) to decompose the organic iodides present. The iodine atoms and molecules resulting from this photodecomposition, and any other elemental iodine, are then reacted with ozone to form solid iodine oxides that deposit on the walls of the reaction vessel (scrubber). The ozone can be fed into the scrubber from an external source or it can be generated in situ by photolysis of the oxygen in the air using ultraviolet radiation (lambda<220 nm).

1971 (INIS-mf—8473, pp 399-405) **Radwaste incineration at CRNL.** Beamer, N.V. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A Waste Treatment Centre (WTC) is being constructed at CRNL to develop and demonstrate processes to convert reactor wastes to a form suitable for disposal. Combustible wastes can be reduced in volume to a stable ash by incineration. A prototype starved-air incinerator in the WTC is currently being commissioned on inactive waste. Overall performance to date is good. Satisfactory control of main process flows and temperatures has been achieved. Checking of system response to process failures has begun. So far, problems with a similar incinerator during initial operation at Ontario Hydro have not been encountered.

1972 (INIS-mf—8473, pp 406-407) **Reverse osmosis plant to process CRNL low-level radioactive liquid wastes.** Bourns, W.T. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The Waste Treatment Centre being built at Chalk River Nuclear Laboratories (CRNL) contains a reverse osmosis (RO) section for processing 30,000 m³/a of dilute radioactive waste. The design, based on experimental work outlined here, incorporates three types of RO modules. An ultrafiltration (UF) section removes all suspended solids from the feed which is then transferred to a spiral wound RO unit. The purified water from it is discharged, while the concentrate from both units is concentrated further in a tubular RO section. The final concentrate goes to another part of the plant for immobilization of the radioactive solids in bitumen.

1973 (INIS-mf—8473, pp 420-425) **Bituminization of nuclear wastes. Development, design and demonstration.** Buckley, L.P.; Pettipas, W.H. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Conversion of reactor wastes to a stable leach-resistant form suitable for disposal has been the objective of a waste management program underway at Chalk River. Incinerator ash, ion-exchange resin and concentrated aqueous waste will be immobilized in bitumen. The dry ash will be combined with molten bitumen in a horizontal mixer while the ion-exchange resin and the liquid slurry will be mixed with a bitumen emulsion in a wiped-film evaporator. Laboratory evaluation of the processes and a demonstration of the wiped-film evaporator at the Douglas Point Nuclear Generating Station have provided details for the design of a Waste Treatment Centre at Chalk River. When the processes become operational in 1982, 200 drums (210 L each) of immobilized waste are expected each year; half will result from solidifying liquid and resin slurries and half from immobilizing incinerator ash.

1974 (INIS-mf—8473, pp 267-275) **Protecting future generations.** Howieson, J. (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This paper addresses the question of how much responsibility this generation should assume for the protection of future generations. This can be expressed as 'How much should we invest to protect future generations from harm or from a reduction in potential good'? The major conclusion is that this generation cannot accept unlimited liability for protecting future generations from the results of this generation's actions. It is recommended that limited liability be quantified by using a discounting method for present and future costs, risks and benefits. For the case of radioactive waste disposal, the discount rate of 1% could be used to reflect the present societal concern. This implies that detriments incurred after about 1000 years would have essentially zero present value. With such a timescale in mind, the task of proving that a proposed disposal facility will work and of obtaining societal acceptance become more realistic.

1975 (INIS-mf—8473, pp 276-283) **Innovation required in the disposal of uranium mine wastes.** Shields, D.H. (Manitoba Univ., Winnipeg (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

At least ten questions concerning the safe disposal of uranium mine and mill wastes remain unanswered after the hearings of the British Columbia Royal Commission of Inquiry into Uranium Mining: how can the natural background levels of radioactivity and toxic substances be determined at a potential mine site; should wastes from uranium mines be disposed of below or above ground; how should waste piles and tailings ponds be covered; should an attempt be made to dry out the mill tailings as they are deposited; how should the ground surface be prepared to receive radioactive waste; how do contaminants migrate through soil or rocks; how do you analyse seepage through unsaturated soil; how should natural groundwater flows be considered during the siting and design of waste disposal; when should the design team give way to the operating team during the construction of a mine; and who is responsible in the long term for the safe condition of uranium mine wastes. The author makes recommendations in each case as to how we should proceed to find the answers. Both research and innovative design solutions are required.

1976 (INIS-mf—8473, pp 370-376) **Design of containment for the long-term isolation of irradiated fuel during underground disposal.** Crosthwaite, J.L.; Barrie, J.N. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment:; Mikasinovic, M.; Hoy, R. (Ontario Hydro, Toronto (Canada)); Cooper, M.; Tough, R. (Bristol Aerospace Limited, Winnipeg, Manitoba (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

As part of the Canadian Nuclear Fuel Waste Management Program, work is underway to design high-integrity, corrosion-resistant containers for the direct disposal of unreprocessed, irradiated fuel in a geologic vault. The role of such containers is to provide isolation of the fuel for at least 300 years, thus ensuring that most fission products are contained for their hazardous lives. Several container concepts are under investigation. The simplest container, called the 'stressed-shell' design, has sufficient strength and shell thickness to withstand the hydrostatic pressures which could be experienced in a flooded disposal vault. Other designs provide internal support for a thinner shell, using a cast-in-place metal matrix, packed-particulate material or structural bracing. Atomic Energy of Canada Limited is investigating the stressed-shell and metal-matrix concepts and coordinating the overall development effort. Ontario Hydro is studying the packed-particulate design, and Bristol Aerospace, the structurally supported design. The principal objectives of the program are to assess the feasibility of each concept in terms of ease of fabrication and inspection, cost and performance in the vault environment. On the basis of this assessment, one or more concepts will be recommended for more detailed evaulation.

1977 (INIS-mf—8473, pp 379-385) **Use of the SYVAC computer code in assessing a nuclear fuel waste disposal concept.** Dormuth, K.W.; Wuschke, D.M.; Mehta, K.K.; Sherman, G.R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The SYVAC computer program has been developed to perform generic risk assessments for the Canadian nuclear fuel waste management program. The assessments are performed by evaluating the behaviour of the disposal system as a whole, taking account of variability in the data specifying the state of the system. SYVAC has been applied with simple submodels using the limited data available and the results illustrate the proposed method for demonstrating acceptability of the concept.

1978 (INIS-mf—8473, pp 392-398) **Strategy for the disposal of low- and intermediate-level radwastes in Canada.** Dixon, D.F. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The intent of the strategy described is to optimize both safety and cost of disposal by classifying waste segments according to hazardous lifetime and to match these to two or more selected disposl concepts graded according to containment and isolation capabilities. The bulk of low- and intermediate-level radwastes arising in Canada are a relatively short-lived hazard requiring isolation for no more than a few hundred years. Burial of this segment at tens-of-metres in quartenary deposits has been proposed as a concept worth evaluating. It is expected that part of the low- and intermedi-

ate-level radwastes will be potentially hazardous for geological time periods. Once methods of isolation for long-lived fuel wastes have been identified, these could be utilized for wastes requiring isolation for longer than a few hundred years. Disposal of a hard-rock vault is being evaluated as a reference concept and costs are presented. It is proposed that waste classification may consider more than two categories to further reduce costs and to better accommodate the radiological character of wastes. The overall disposal strategy should be flexible enough to account for present waste management practices and anticipated future needs.

1979 (INIS-mf—8473, pp 413-419) **Application of conventional building technology in the storage of low level solid reactor wastes.** Olden, L.R.; Booth, R.R.; Grande, L. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Ontario Hydro has been engaged in the interim storage of low and medium-level solid reactor wastes since 1967. Over the past 14 years, engineered in-ground concrete trenches have provided safe, retrievable storage capacity for the bulk of the waste arising from Ontario Hydro's nuclear generation program. In addition to concrete trenches, in-ground concrete cylinders (tile holes) and above ground concrete vaults (Quadricells) have been designed and constructed to store disposable ion-exchange columns, spent filters and bulk ion-exchange resins. In 1978, Ontario Hydro initiated a conceptual design study on the future storage of solid reactor wastes. The objective of the study was to develop a bulk storage concept which would reduce both reactor waste storage costs and storage site land consumption. The study, completed in 1979, recommended a conventional pre-stressed, pre-fabricated, concrete storage building concept as Ontario Hydro's future bulk reactor waste storage facility. This new, low-level storage building (LLSB) will be placed in service by September 1982, reducing bulk storage costs by a factor of three while reducing land consumption by a factor of 10 over present Ontario Hydro trench storage facilities. The storage building complements the capabilities of the other Ontario Hydro storage facility designs.

1980 (INIS-mf—8473, pp 428) **Safety assessment of fuel water disposal appropriate to the German waste management programme.** Maass, K.E. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Summary.

1981 (INIS-mf—8473, pp 432-434) **Preparing to license deep disposal facilities. The international scene.** Coady, J. (Atomic Energy Control Board, Ottawa, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Research into the availability of deep, geological facilities for radioactive waste disposal is a very serious and extensive undertaking in many countries. It is also an activity in which there is a high degree of international cooperation and agreement. Before any disposal facility can be constructed, however, and before it can eventually be sealed up and left to function in the manner for which it was designed, it must go through the assessment procedures of the regulatory authorities in each country. It is interesting to examine the extent to which there is agreement in the approach being adopted by regulatory authorities to the licensing of such facilities. At the present time there are no deep geological facilities anywhere in the world. There are, therefore, no licenses to examine to see what licensing procedures were used, but by looking at what is being done in individual countries, in the International Atomic Energy Agency and in the Nuclear Energy Agency it is possible to obtain an idea of the trends which are developing.

1982 (INIS-mf—8473, pp 435-436) **Canada's contribution towards international consensus on nuclear fuel waste disposal.** Lyon, R.B. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Consensus on the safety of nuclear waste disposal will require three major elements: (1) specification of a realistic concept; (2) assessment of the safety of the proposed concept; and (3) validation of the results of the assessment. The author discusses aspects and outlines the Canadian approach to each.

1983 (INIS-mf—8535) **Treatment of Pu-containing waste by acid digestion (wet combustion).** Wieczorek, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 18p. (CONF-8209134—31). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703601.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Acid digestion as a process of treatment of plutonium-containing solid waste was developed and demonstrated under conditions of an active operation with respect to the recovery of plutonium. The process composes the following main steps: waste shredding, waste carbonization, waste oxidation and conversion of plutonium oxide to plutonium sulphate, off-gas treatment, acid recovery and plutonium separation. The technical, safety and operational details of the plant will be presented. Furthermore, methods of the purification of separate plutonium and solidification of secondary waste for final disposal will be described..

1984 (INIS-mf—8544) **Site evaluation for disposal facilities in salt.** Brewitz, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 29p. (CONF-8209134—27). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703603.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Although the various geoscientific investigations are not finished yet, the results so far show that the Konrad mine has some outstanding geological features as required for a safe disposal of radioactive wastes. The iron ore formation is extremely dry. Seepage water is no threat to the waste disposal operation and the repository itself. The construction of stable underground storage rooms which are sufficiently sized in volume is possible. Galleries containing wastes in drums or contaminated components can be refilled and sealed efficiently as well as the rest of the mine including the two shafts. Thereafter the geological containment with its favourable structure and ideal petrology will be an effective barrier against the contamination of the biosphere. As investigated this applies in particular to the low-active wastes with their specific nuclide inventory and the short decay time.

1985 (INIS-mf—8552) **Radioactive waste disposal in the sea and alternative methods of ultimate disposal.** Hagen, A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 56p. (CONF-8209134—29). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703605.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

This paper discusses two topics. The first is the disposal of low-level radioactive wastes into the seas which is currently being practiced by a few countries; and the second topic, some alternative methods of disposal for high-level wastes.

1986 (INIS-mf—8553) **Treatment of concentrated waste for storage and disposal.** Vejmelka, P.; Koester, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 17p. (CONF-8209134—26). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703602.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Cementation of concentrates from BWR, PWR reactors and reprocessing plants is a very well known and widely used method for solidification of the considered wastes. The process is a simple and cheap one. The quality of the produced waste forms normally is sufficient for the considered wastes and disposal options. By some constituents (e.g., boric acid) the hydration of the cement is inhibited. By a special treatment with appropriate additives these problems can be eliminated. The waste loading of the cemented waste form is limited by the w/c-ratio and the salt content of the concentrate.

1987 **(INIS-mf—8554) Waste management at the Karlsruhe Nuclear Research Center.** Hoehlein, G.; Lins, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 19p. (CONF-8209134—25). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703600.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

In the Karlsruhe Nuclear Research Center the responsibility for waste management is concentrated in the Decontamination Department which serves to collect and transport all liquid waste and solid material from central areas in the center for further waste treatment, clean radioactive equipment for repair and re-use or for recycling of material, remove from the liquid effluents any radioactive and chemical pollutants as specified in legislation on the protection of waters, convert radioactive wastes into mechanically and chemically stable forms allowing them to be transported into a repository.

1988 **(INIS-mf—8616) Sub-seabed burial of radioactive waste and liabilities.** Reyners, P. (Nuclear Energy Agency, 75 - Paris (France)). Oct 1982. 25p. (In French). (CONF-8210195—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704425.

From International colloquium on use of the seabed and liabilities; Bordeaux, France (26 Oct 1982).

The author of this report discusses the problems raised by application of the special third party liability system to damage which may result from embedding radioactive waste in the subseabed. The matter of general liability of the State for nuclear damage caused to the environment is also dealt with in this paper. (NEA).

1989 **(INIS-mf—8617) Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor.** Boyer, G.D. (Department of Energy, Washington, DC (USA)). Oct 1982. 10p. (CONF-8210195—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704413.

From International colloquium on use of the seabed and liabilities; Bordeaux, France (26 Oct 1982).

This paper describes the US Sub-seabed Disposal Program and how this radioactive waste disposal concept fits within the National Waste Terminal Storage Program. The objectives, status and plans to assess the technical, environmental and institutional feasibility of the sub-seabed concept are discussed, as well as related research on seabed disposal in the framework of the NEA Seabed Working Group. The institutional and legal aspects of such disposal are also outlined. (NEA).

1990 **(INIS-mf—8620) Financial security and insurance for damage caused by use of the seabed for radioactive waste disposal.** Lagorce, M. (CEA, 75 - Paris (France)). Oct 1982. 14p. (In French). (CONF-8210195—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704426.

From International colloquium on use of the seabed and liabilities; Bordeaux, France (26 Oct 1982).

This paper reviews radioactive waste sea dumping operations conducted since 1967 by several European countries, in particular France, under the auspices of the OECD Nuclear Energy Agency in the context of the Paris Convention liability system. The author analyses the relevant provisions of the Convention and their applicability to the different stages of sea dumping operations. State intervention above insurance limits is discussed as well as limitation of liability in time. (NEA).

1991 **(INIS-mf—8628) Scientific cooperation agreement on an investigation and surveillance programme on the site for radioactive waste disposal in the North-East Atlantic between the Nuclear Research Centre (CEN), Belgium and the National Laboratory of Industrial Engineering and Technology (LNETI), Portugal.** (Portugal). 9 Dec 1982. 9p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704414.

Also in French.

This Agreement was signed between the Belgian Nuclear Research Centre (CEN) and the Portuguese Laboratory of Industrial Engineering and Technology (LNETI). Its purpose is the study of the critical transfer pathways which would lead to radiation exposures to man from radioactive waste dumping in the North-East Atlantic. The Agreement became operational on the date of its signature by both Parties and will remain in force for three years. (NEA).

1992 **(JAERI-M—82-088) Simulated HLLW compositions for cold test of waste management development.** Banba, Tsunetaka; Kimura, Hideo; Kamizono, Hiroshi; Tashiro, Shingo. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703809.

Three grades of simulated high-level liquid waste (HLLW)-JW-A, JW-B, and JW-C - were proposed to be used respectively according to stages of various cold tests for safety assessment of HLW management. The composition of HLLW was estimated taking into account the spectrum of fission products and actinides, waste volume, corrosion products, and chemical additives. One of conditions, the spectrum of fission products and actinides of LWR spent fuels, was calculated by DCHAIN-code. Fuel burn-up of 28,000 MWD/ $tUO_2$ and 33,000 MWD/ $tUO_2$ were adopted as normal and maximum values of Japanese LWR power plants. The other conditions were estimated using the data obtained at Marcoule plant in France.

1993 **(NVO—263) Public hearings panel report: a summary of public concerns regarding the characterization of a repository site in Nevada.** (USDOE Nevada Operations Office, Las Vegas). Nov 1983. 196p. NTIS, PC A09/MF A01. Order Number DE84002240.

This report summarizes testimony given during public hearings on March 30, 1983, in Las Vegas, Nevada, and March 31, 1983, in Reno, Nevada, regarding the proposed nomination of Yucca Mountain as a candidate for intensive site characterization to determine whether it is suitable for a high-level radioactive waste repository. It also summarizes the written comments received by the Department of Energy through April 25, 1983, an announced deadline for written submissions.

1994 **(NVO—266) Cultural resources overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada.** Pippin, L.C.; Zerga, D.L. (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Nov 1983. Contract AC08-81NV10162. 122p. NTIS, PC A06/MF A01. Order Number DE84002824.

Chapters are devoted to: the natural setting; history of archaeological research on the Nevada Test Site; the cultural setting; and known historic and prehistoric cultural resources within the Nevada Nuclear Waste Storage Investigations project area.

1995 **(NVO—267) Annotated bibliography of cultural resources literature for the Nevada Nuclear Waste Storage Investigations.** (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Nov 1983. Contract AC08-81NV10162. 63p. NTIS, PC A04/MF A01. Order Number DE84002825.

This annotated bibliography of the cultural resources literature pertinent for the Nevada Nuclear Waste Storage Investigations was assembled in order to (1) identify and evaluate the prehistoric and historic properties previously recorded in the Nevada Nuclear

Waste Storage Investigations Project Area of southern Nye County, Nevada, (2) identify and develop research problems that have been and/or could be addressed by the cultural resources of this area, (3) isolate factors that might be important in the selection of a potential locality for a high level nuclear waste repository in the project area, and (4) critically evaluate the adequacy and current status of cultural resources knowledge in the project area. 195 references.

1996 **(OEFZS—4214) Sea dumping of radioactive wastes. Part 1: Basic considerations of marine environment.** Krejsa, P. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Apr 1983. 66p. (In German). (AV—9/83). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703812.

Sea dumping of low level radioactive waste is a disposal method practised by a number of states, controlled by OECD/NEA. It makes use of the capacity of the oceans to dilute the radionuclides to levels acceptable concerning resulting dose burdens. For the determination of release rates some oceanographic model have been developed, describing the physical behaviour of the released radionuclides. It is not to be assumed that a complete mathematical description of the involved processes can be made. Too many parameters are dependent and varying as there is the chemical behaviour of different valence states, complexing agents, distribution patterns etc. But it can be seen that the existing description methods allow the adequate modelling of the short and the long term behaviour of the radionuclides. The use of pessimistic assumptions for distribution and reconcentration is sufficient to consider uncertainties of the model. Therefore the arguments of Greenpeace, kindly submitted by this organisation for this study, show no open question, which has not been considered on the sea dumping procedures under surveillance of the OECD/NEA.

1997 **(OEFZS—4215) Sea dumping of radioactive wastes. Part 2: Behaviour of radionuclides in seawater.** Krejsa, P. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Apr 1983. 73p. (In German). (AV—10/83). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703813.

Sea dumping of low level radioactive waste is a disposal method practised by a number of states, controlled by OECD/NEA. It makes use of the capacity of the oceans to dilute the radionuclides to levels acceptable concerning resulting dose burdens. For the determination of release rates some oceanographic model have been developed, describing the physical behaviour of the released radionuclides. It is not to be assumed that a complete mathematical description of the involved processes can be made. Too many parameters are dependent and varying as there is the chemical behaviour of different valence states, complexing agents, distribution patterns etc. But it can be seen that the existing description methods allow the adequate modelling of the short and the long term behaviour of the radionuclides. The use of pessimistic assumptions for distribution and reconcentration is sufficient to consider uncertainties of the model. Therefore the arguments of Greenpeace, kindly submitted by this organisation for this study, show no open question, which has not been considered on the sea dumping procedures under surveillance of the OECD/NEA.

1998 **(OEFZS—4216) Sea dumping of radioactive wastes. Part 3: Dumping practice and radioecology.** Krejsa, P. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Apr 1983. 68p. (In German). (AV—11/83). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703814.

Sea dumping of low level radioactive waste is a disposal method practised by a number of states, controlled by OECD/NEA. It makes use of the capacity of the oceans to dilute the radionuclides to levels acceptable concerning resulting dose burdens. For the determination of release rates some oceanographic model have been developed, describing the physical behaviour of the released radionuclides. It is not to be assumed that a complete mathematical description of the involved processes can be made. Too many parameters are dependent and varying as there is the chemical behaviour of different valence states, complexing agents, distribution patterns etc. But it can be seen that the existing description methods allow the adequate modelling of the short and the long term behaviour of the radionuclides. The use of pessimistic assumptions for distribution and reconcentration is sufficient to consider uncertainties of the model. Therefore the arguments of Greenpeace, kindly submitted by this organisation for this study, show no open question, which has not been considered on the sea dumping procedures under surveillance of the OECD/NEA.

1999 **(ORNL—5933, pp 4-33) Nuclear waste management.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

Some accomplishments in the nuclear waste management area are: demonstration of an engineering-scale, fixed-bed process for removal of $^{14}C$ (as $CO_2$) from specific off-gas streams at nuclear facilities and concomitant immobilization as $Ba(CO_3)_2$; expansion of the HIGHWAY routing model to include the locations of all commercial power reactors, 800 commercial and military airports, and principal DOE shipping sites; and demonstration of the feasibility of using FUETAP (formed under elevated temperature and pressure) concrete as a cost-effective alternative waste form for the disposal of high-level wastes.

2000 **(PB—83-240879) Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment.** Bremner, W.B.; Biggs, A.; Birkhoff, G.; Depraz, J.; Barou, J. (Commission of the European Communities, Luxembourg). [nd]. 136p. (EUR—8020-EN). NTIS, PC E07/MF E07.

The report, (Part 1 of a three-part final report) deals with: (1) performance of the DNPDE solid waste measurement system, (2) preliminary results from the first PFR (prototype fast reactor) fuel reprocessing campaign, (3) interpretational models, and (4) calibration methods.

2001 **(PB—83-245498) Identification of cost factors for the ocean disposal alternative for low-level radioactive waste.** Hill, D.; Sailor, V.L. (Brookhaven National Lab., Upton, NY (USA)). Mar 1983. 27p. NTIS, PC A03/MF A01.

A set of economic ground rules is proposed for making cost comparisons between various alternative options for disposing of low-level radioactive wastes. Included are procedures for converting all costs to a common basis and a description of the types of costs that should be included. The major cost factors are identified for several alternatives for the disposal of contaminated soils and neutron activated metallic structure. A program for the actual cost analysis is outlined, and manpower estimates for the studies are presented.

2002 **(PNL—4800) In-situ vitrification of transuranic wastes: systems evaluation and applications assessment.** Oma, K.H.; Brown, D.R.; Buelt, J.L.; FitzPatrick, V.F.; Hawley, K.A.; Mellinger, G.B.; Napier, B.A.; Silviera, D.J.; Stein, S.L.; Timmerman, C.L. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 214p. NTIS, PC A10/MF A01. Order Number DE84002167.

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Major advantages of in-situ vitrification (ISV) as a means of stabilizing radioactive waste are: long term durability of the waste form; cost effectiveness; safety in terms of minimizing worker and public exposure; and applicability to different kinds of soils and buried wastes. This document describes ISV technology that is available as another viable tool for in place stabilization of waste sites. The following sections correspond to the chapters in the body of this document: description of the ISV process; analysis of the performane of the ISV tests conducted thus far; parameters of the ISV process; cost analysis for the ISV process; analysis of occupational and public exposure; and assessment of waste site applications.

2003 **(PNL-SA—11136) Status, direction, and critical issues of waste treatment technology.** Knowlton, D.E.; Bonner, W.F. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1983. Contract AC06-76RL01830. 15p. (CONF-830812—58). NTIS, PC A02/MF A01. Order Number DE84001342.

From 18. intersociety energy conversion engineering conference; Orlando, FL, USA (21 Aug 1983).

Nuclear power production and related activities generate radioactive wastes that must be safely managed to protect workers and the general public. The liquid-fed ceramic melting (LFCM) vitrification process is the reference process for vitrifying high-level nuclear waste in the US as well as in Japan and India. The French are currently using a rotary kiln calciner/metallic melter system at their reprocessing facility. Compaction or controlled-air incineration are the currently preferred options for low-level waste solids, followed by immobilization in an appropriate matrix. The Nuclear Waste Policy Act of 1982 is a significant step in proceeding with waste treatment and disposal. Programs can now build on past work to assure that public safety and regulations atre met in a cost-effective manner. 7 references, 2 figures, 3 tables.

2004 **(PNL-SA—11541) In-situ vitrification of transuranic wastes: systems evaluation and applications assessment.** FitzPatrick, V.F.; Brown, D.R.; Buelt, J.L.; King, S.E.; Napier, G.A.; Oma, K.H.; Silviera, D.J.; Timmerman, C.L. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1983. Contract AC06-76RL01830. 16p. (CONF-8308106—23). NTIS, PC A02/MF A01. Order Number DE84002594.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

In-situ vitrification (ISV) is an emerging technology, suitable for the stabilization of buried radioactive waste. In just under three years in-situ vitrification has moved from a concept tested in the laboratory to an achievable reality, with a series of 18 laboratory (engineering-scale) tests and 7 field (pilot-scale) tests. A radioactive make-up site of TRU wastes and mixed fission products has been stabilized with the pilot-scale system. In this test, approximately 25 kg of contaminated soil, containing about 600 nCi/g of $^{230}Pu$/$^{241}Am$, was successfully vitrified without release of radionuclides to the environment. The ISV tests have been supplemented by public and occupational exposure calculations which show that releases fall below the limits set by the federal government for both routine and accident conditions. Performance analysis has verified the process effectiveness in terms of preventing the migration of radionuclides into the bioshpere in the far-distant (1000 and 10,000 year) future under an array of intrusion scenarios including inadvertent and deliberate human intrusion. Cost analyses have shown that for both Hanford and a generic site, processing costs are less than the cost of disposal of low-level waste at US Department of Energy disposal sites.

2005 **(UCID—19926) Initial specifications for nuclear waste package external dimensions and materials.** Gregg, D.W.; O'Neal, W.C. (Lawrence Livermore National Lab., CA (USA)). Sep 1983. Contract W-7405-ENG-48. 27p. NTIS, PC A03/MF A01. Order Number DE84002110.

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Initial specifications of external dimensions and materials for waste package conceptual designs are given for Defense High Level Waste (DHLW), Commercial High Level Waste (CHLW) and Spent Fuel (SF). The designs have been developed for use in a high-level waste repository sited in a tuff media in the unsaturated zone. Drawings for reference and alternative package conceptual designs are presented for each waste form for both vertical and horizontal emplacement configurations. Four metal alloys: 304L SS, 321 SS, 316L SS and Incoloy 825 are considered for the canister or overpack; 1020 carbon steel was selected for horizontal borehole liners, and a preliminary packing material selection is either compressed tuff or compressed tuff containing iron bearing smectite clay as a binder.

2006 **(UCRL—15560) Study of selected off-gases produced during the immobilization of nuclear wastes in the SYNROC process. Final report for the year ended December 31, 1982.** Carpenter, J.H.; McMullen, J.C.; Olmscheid, B.A.; Chezick, P. (Saint Cloud State Univ., MN (USA). Dept. of Chemistry). 31 Dec 1982. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. Order Number DE84002789.

The vaporization of cesium from the SYNROC mineral barium-cesium hollandite was studied over the temperature range 900°C to 1150°C using the transpiration method. With a dry argon-5% hydrogen carrier gas, the pressure of cesium over barium-cesium hollandite solid solution follows the relationship, log P/sub Cs/(atm) = 2.743 - 1.135 X $10^4$/T(K). The heat of vaporization is 217 +- 15 kJ/mole. The presence of water vapor increased the volatility of cesium.

2007 **(WIPP-DOE—171) Project progress report for month ending September 30, 1983.** (Westinghouse Electric Corp., East Pittsburgh, PA (USA)). 1983. Contract AC04-78AL05346. 9p. NTIS, PC A02/MF A01. Order Number DE84002667.

The express purpose of the Waste Isolation Pilot Plant is to provide a research and development facility to demonstrate the safe disposal of radioactive waste resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission Progress in site construction and design and engineering is reported. The status of technical and institutional activities and scientific and experimental studies is given.

2008 **Projected occupational exposures during WIPP operations.** Baer, W. (Westinghouse Electric Corp., Advanced Energy Systems, Waste Isolation Pilot Plant, P.O. Box 40039, Albuquerque, NM 87196). *Transactions of the American Nuclear Society;* **44**: 78(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2009 **Regional compacting for low-level radioactive waste management: an innovative approach.** Nern, C.F.; Levin, G.B. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 84(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2010 **Survey of power plant LLW volume reduction and storage actions/plans.** Dam, A.S.; Naughton, M.D.; Rutland, L. (Burns & Roe, Inc., 650 Winters Avenue, Paramus, NJ 07675). *Transactions of the American Nuclear Society;* **44**: 84-85(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2011 **Management of radwaste at Chalk River, Canada: storage and disposal.** Dixon, D.F. (Atomic Energy of Canada Limited, Chalk River Nuclear Laboratories, Chalk River, Ontario K0J 1J0). *Transactions of the American Nuclear Society;* **44**: 85-86(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2012 **Treatment of radioactive liquid wastes at the Loviisa nuclear power station, Finland.** Kallonen, I. (Imatran Voima Oy, P.O. Box 138, SF-00101 Helsinki 10). *Transactions of the American Nuclear Society;* **44**: 86-87(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2013 **Radwaste characterization: key to an optimized waste management plan.** Pierce, R.E. (Gilbert Commonwealth, 209 E. Washington Avenue, Jackson, MI 49201). *Transactions of the American Nuclear Society;* **44**: 87-88(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2014 **A systems modeling approach to evaluating low-level waste disposal systems.** Buchnea, A. (MacLaren Plansearch Inc., 33 Yonge Street, Toronto, Ontario M5E 1E7). *Transactions of the American Nuclear Society;* **44**: 88-89(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2015 **Concentrations of selected short-lived isotopes in a low-level waste inventory.** Rogers, V.C.; Sandquist, G.M.; Sutherland, A.A. (Rogers and Associates Engineering Corp., P.O. Box 330, Salt Lake City, UT 84110). *Transactions of the American Nuclear Society;* **44**: 89-90(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2016 **States' approach to low-level waste disposal.** Eng, J. (New Jersey Dept. of Environmental Protection, Bureau of Radiation Protection, 380 Scotch Road, Trenton, NJ 08628). *Transactions of the American Nuclear Society;* **44**: 99-100(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2017 **Low-level waste disposal technology.** Levin, G.B. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 100(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2018 **Commercial waste treatment technology and programs.** Burkholder, H.C.; McElroy, J.L. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 100-101(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2019 **High-level waste disposal.** Vieth, D.L. (U.S. Department of Energy, Nevada Operations Office, P.O. Box 14110, Las Vegas, NV 89114). *Transactions of the American Nuclear Society;* **44**: 101-102(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2020 **Waste packages for high-level waste repositories.** Basham, S.J. Jr. (Battelle, Office of NWTS Integration, 505 King Avenue, Columbus, OH 43201). *Transactions of the American Nuclear Society;* **44**: 102-103(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2021 **Utilizing existing technology to improve environmental protection.** Filter, H.E. (Dow Chemical Co., Larkin Laboratory, Midland, MI 48640). *Transactions of the American Nuclear Society;* **44**: 103-104(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2022 **Summary of the Basalt Waste Isolation Project.** Deju, R.A.; Marron, J.F. (Rockwell Hanford Operations, P.O. Box 800, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 110-112(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2023 **Mass transport from a waste emplaced in backfill and rock.** Chambre, P.L.; Lung, H.C.; Pigford, T.H. (University of California, Berkeley, CA 94720). *Transactions of the American Nuclear Society;* **44**: 112-113(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2024 **Solubility-limited transport of radionuclides through fractured rock.** Kobayashi, R.; Chambre, P.L.; Kanki, T.; Pigford, T.H.; Sato, Y. (University of California, Berkeley, CA 94720). *Transactions of the American Nuclear Society;* **44**: 113-115(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2025 **Effect of repository heating on dissolution of glass waste.** Pigford, T.H.; Chambre, P.L.; Zavoshy, S. (University of California, Berkeley, CA 94720). *Transactions of the American Nuclear Society;* **44**: 115-116(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2026 **Radionuclide migration in transport paths bounded by the environment.** Foglia, M. (Cogswell College, 600 Stockton Street, San Francisco, CA 94108). *Transactions of the American Nuclear Society;* **44**: 116-117(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2027 **Error analysis of nuclear waste migration.** Fullwood, R.R. (Science Applications, Inc., 5 Palo Alto Square, Suite 200, Palo Alto, CA 94304). *Transactions of the American Nuclear Society;* **44**: 117-118(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2028 **Leach testing of INEL waste forms in a gamma field.** Schuman, R.P. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 119-120(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2029 **Development of CT techniques for integrity evaluation of vitrified solids.** Nagaki, H.; Murata, T.; Nakamura, Y.; Sano, A.; Uchida, K. (Power Reactor and Nuclear Fuel Development Corporation, 9-13, 1-chome, Akasaka, Minato-ku, Tokyo). *Transactions of the American Nuclear Society;* **44**: 120(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2030 **Peak high-level waste package temperature versus annular air gap width.** Burns, B.S.; Christensen, R.N. (The Ohio State University, Columbus, OH 43210). *Transactions of the American Nuclear Society;* **44**: 121-122(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2031 **Pacing and logistics of high-level waste disposal.** Kohn, H.W. (State of Ohio Power Siting Board, 580 S. High Street, Suite 300, Columbus, OH 43215). *Transactions of the American Nuclear Society;* **44**: 122(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2032 **Actinide transmutation with a $UF_6$ reactor.** Wan, P.T.; Clement, J.D. (McMaster University, Hamilton, Ontario L8S 4M1). *Transactions of the American Nuclear Society;* **44**: 123-124(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2033 **Policy directions: Department of Energy transuranic waste management programs.** Oertel, G.K.; Camacho, A.A. (U.S. Department of Energy, Washington, DC 20545). *Transactions of the American Nuclear Society;* **44**: 180(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2034 **A technology implementation perspective on defense transuranic waste management.** Gilbert, K.V. (Rockwell International, Rocky Flats Plant, P.O. Box 464, Golden, CO 80401). *Transactions of the American Nuclear Society;* **44**: 180-181(Jun 1983). (CONF-830609—).
From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2035 **Some chemical issues involved in the management and disposal of TRU wastes.** Schulz, W.W. (Rockwell Hanford Operations, P.O. Box 800, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 181-182(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2036 **WIPP: the solution to disposal of defense transuranic waste.** Weart, W.D. (Sandia National Laboratories, P.O. Box 5800, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **44**: 182-183(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2037 **Transuranic waste management: technology status and needs.** Croff, A.G.; Moghissi, A.A.; Ray, D.L.; Taboas, A.L. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 183-184(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2038 **The certification program of transuranic wastes at INEL.** Mayberry, J.L.; Anderson, B.C.; Clements, T.L.; Hinckley, J.P.; McKinley, K.B.; Smith, T.H. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 184-185(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2039 **Neutron transmission measurements to determine isotopic content of spent fuel.** Behrens, J.W.; Johnson, R.G.; Schrack, R.A. (National Bureau of Standards, U.S. Department of Commerce, Washington, DC 20234). *Transactions of the American Nuclear Society;* **44**: 204-205(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2040 **Concreting of incinerated simulated TRU wastes.** Gibson, G.W.; Bentzen, E.H. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 212(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2041 **Calculational results compared to benchmark critical experiments on annular tanks.** Pearson, J.S. (Rockwell International, Rocky Flats Plant, P.O. Box 464, Golden, CO 80401). *Transactions of the American Nuclear Society;* **44**: 286-287(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2042 **High-level radioactive waste disposal in the ocean floor: an introduction.** Hinga, K.R. (Univ. of Rhode Island); Lipkin, J. *Sea Technology;* **24**: No. 2, 36-39(Feb 1983).

The radioactive waste disposal scenario being considered by most nations involves finding a suitable location, and then packaging the waste prior to burial. It is assumed that an appropriate combination of site, packaging and burial standards will insure isolation from the biosphere for times sufficiently long to permit natural radioactive decay of the waste to acceptable background levels. The time necessary for this to occur is 10,000 years or more, depending on the assumptions made about what constitutes an acceptable level of residual radioactivity. After 10,000 years, 99.9% of the radioactive isotopes contained in a typical high level waste form will have decayed to stable elements. With this time scale in mind, we must then ask ourselves: what site characteristics are desireable to insure such isolation? A brief summary of several characteristics is given.

2043 **The U.S. DOE commercial waste disposal programs.** Coffman, F.E. (U.S. Department of Energy, Washington, DC 20545). *Transactions of the American Nuclear Society;* **42**: 91(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2044 **Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley.** *EIS (Environmental Impact Statements);* **6**: No. 9, 46(Sep 1982).

Implementation of a long-term management plan for liquid high-level radioactive wastes stored in underground tanks at the Western New York Nuclear Service Center in West Valley, New York is proposed. The site contains 600,000 gallons of liqid high-level radioactive wastes stored in underground tanks. The management scheme would involve removal of the wastes from the tanks for onsite processing to transform the wastes into solid terminal waste form. Specially, the project would involve separation of sludge from the radioactive supernate via centrifugation and combination of the radioactive components with the sludge to form a high-level terminal waste form suitable for geologic disposal. A low-acitivity salt cake would remain. Positive and negative impacts are discussed.

2045 **Coating of crystalline nuclear waste forms to improve inertness.** Stinton, D.P.; Angelini, P.; Caputo, A.J.; Lackey, W.J. (Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Journal of the American Ceramic Society;* **65**: No. 8, 394-399(Aug 1982).

Microspheres of a crystalline waste form prepared by sol-gel processing were successfully coated with layers of pyrolytic carbon and silicon carbide to isolate the radioactive wastes from the biosphere. A separate process for cesium immobilization was developed, which loads 5 wt% Cs onto zeolite particles for subsequent coating. Pyrolytic carbon-coated particles showed leach rates $\approx$2 to 4 orders of magnitude less than the candidate reference borosilicate glass waste form. Aqueous leach-test results of coated waste forms were below detection limits of such sensitive analytical techniques as atomic absorption and inductively coupled plasma atomic emission.

2046 **Application of oil exploration techniques toward finding a nuclear waste repository site.** Laughon, R.B. (Battelle Memorial Inst., Columbus, OH). *Interstate Oil Compact Commission Committee Bulletin;* **24**: No. 1, 36-39(Jun 1982).

Through its National Waste Terminal Storage (NWTS) Program, the U.S. Department of Energy is responsible for providing facilities to permanently dispose of high-level nuclear waste in a manner that will ensure public health and safety and that will be environmentally acceptable. Three separately coordinated projects, which have placed emphasis on deep, underground repositories are described. They are the Basalt Waste Isolation Project at the Hanford Reservation in Wahington, the Nevada Nuclear Waste Storage investigations at the Nevada Test Site, and a project focusing on suitable rock types in the remainder of the conterminous 48 states, managed by the Office of Nuclear Waste Isolation in Columbus, Ohio. The last-mentioned project is presently focused on rock salt and crystalline formations as suitable host rocks for a repository. The geologic evaluation considers stratigraphy, structure, hydrogeology, seismicity, tectonic history, Quaternary features, physiography, energy/mineral resources, and geotechnical factors. Extensive use has been made of drill stem test data, a mainstay of petroleum exploration since the late 1920's, to obtain hydrologic information. (JMT)

2047 **Waste management in nuclear facilities. Abstracts.** Karlsruhe, Germany; Kernforschungszentrum Karlsruhe G.m.b.H. (1982). vp. (CONF-8209134—Absts.). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

Separate abstracts were presented for each of the papers included in the data base.

2048 **Ion exchange mechanism of cesium removal by cyanoferrates.** Li, E.F.T. London, England; London University (Oct 1980). 154p. Available from British Library, Boston Spa, Wetherby, Yorks. No. D70095/81.

Two different cesium sorption mechanisms have been established for potassium copper ferrocyanide, KCuFCH, depending upon solution concentration. Experimental investigations indicate that the sorption process is controlled by liquid film diffusion at cesium concentrations $< 1.5 \times 10^{-5}$M, and by an ion exchange mechanism governed by chemical reaction between the cesium and potassium in the cyanoferrate at higher concentration. A shell pro-

gressive reaction rate model was used to interpret the experimental results. The sorption of cesium by other cyanoferrates has also been studied. The importance of cesium removal or nuclear waste disposal and radioactive waste treatment by ion exchange are discussed.

## 0530 Environmental Aspects

*REFER ALSO TO CITATION(S) 1912, 1969, 1974, 1988, 1989, 2005, 2008, 2013, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2029*

2049 (INIS-mf—8473, pp 429-431) **Environmental effect of the barriers in the KBS disposal system.** Paap, T. (Svensk Kaernbraenslefoersoerjning AB, Stockholm). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Swedish law requires that prior to the fuelling of a new power reactor the operator shall show how and where the spent fuel or the high level waste can be finally disposed of in an absolutely safe way. The Swedish nuclear power utilities responded by organizing the Nuclear Fuel Safety Project (KBS). In the KBS studies the canister that contains the spent fuel and the geosphere provide the two main barriers. Efforts underway to model the complex chemistry of the buffer zone should make it possible to give more credit to the barrier effect of bentonite and reduce the requirements on the host rock and canister barriers.

2050 **(INIS-mf—8608) Uranium Mining (Environment Control) Act 1979 No. 46 of 1979.** (The Northern Territory of Australia). 10 May 1979. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704417.

The purpose of this Act is to control the mining of uranium in the Alligator Rivers Region with a view to lessening any damage which may be caused to the environment. The Act provides for the control of mining of certain substances, for an authorization system for construction and use of facilities, equipment and processes as well as for environmental protection requirements. (NEA).

2051 **(NVO—268) Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada.** Bowen, J.L.; Egami, R.T. (Nevada Univ., Las Vegas (USA). Desert Research Inst.). Nov 1983. Contract AC08-81NV10162. 34p. NTIS, PC A03/MF A01. Order Number DE84002817.

This bibliography covers a number of aspects which will go into an environment of the effects of a nuclear waste repository on the air quality of the Nevada Test Site and its environs. The following categories are included: weather and climate of Nevada; long-term climatology of the Nevada Test Site; diffusion associated with the Nuclear Rocket Development Station at Jackass Flats; air quality of the Southwest; regional dispersion characteristics; dispersion modeling over flat and complex terrain, fugitive dust studies; noise; and regulations and recommended procedures. 104 references.

2052 **(NVO—269) Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada.** Bowen, J.L.; Egami, R.T. (Nevada Univ., Las Vegas (USA). Desert Research Inst.). Nov 1983. Contract AC08-81NV10162. 86p. NTIS, PC A05/MF A01. Order Number DE84002818.

Portions are illegible in microfiche products. Original copy available until stock is exhausted.

This report discusses atmospheric considerations for a nuclear waste repository at NTS. It presents the climatology of Nevada, and NTS in particular, including paleoclimatology for past climatic changes, present climatology for mean meterological conditions, feature climatological expectations, and occurrence of extreme weather. It discusses air quality aspects including an estimation of present air quality and possible dispersion conditions on NTS. It briefly assesses noise problems. It outlines a plan for an Environmental Impact Statement and covers the federal and state regulations for air quality. It identifies data for climatology and air quality and evaluates their applicability to nuclear waste repository.

## 0540 Health And Safety

*REFER ALSO TO CITATION(S) 1935, 1942, 1968, 1971, 2002, 2043, 2253, 2454*

2053 (INIS-mf—8473, pp 204-209) **Training of health physics services staff at the Sellafield Works of British Nuclear Fuels.** Tagg, B. (British Nuclear Fuels Ltd., Sellafield). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This paper describes the qualifications required and the training of health physics non-industrial and industrial staff who provide a radiological protection service to the Sellafield site. The training offered may consist of formal group instruction, programmed learning using written texts, videotape lectures, and on-the-job training by line management. Experience has shown that formal oral and practical instruction to small groups is the most effective form of training when supplemented by on-the-job training.

2054 (INIS-mf—8473, pp 377-378) **Shield integrity examinations at the NWCF.** Olson, N.C.; Henry, R.N. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A New Waste Calcining Facility has been built at the Idaho Chemical Processing Plant to convert radioactive liquid wastes to the solid form. An extensive examination program of the facility's radiation shielding was performed prior to 'hot' operation. The various techniques used to complete this program are discussed. The results of the program are also described, as well as recommendations on shield examinations.

2055 (INIS-mf—8473, pp 426-428) **Disposal safety. Is consensus necessary.** Bartlett, J.W. (Analytic Sciences Corp., Reading, MA (USA)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

International consensus does not seem to be necessary or appropriate for many of the issues concerned with the safety of nuclear waste disposal. International interaction on the technical aspects of disposal has been extensive, and this interaction has contributed greatly to development of a consensus technical infrastructure for disposal. This infrastructure provides a common and firm base for regulatory, political, and social actions in each nation.

## 0550 Regulations

*REFER ALSO TO CITATION(S) 1923*

2056 **(DOE/DP—0001/12) Semi-annual report on strategic special nuclear material inventory differences.** (USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of Safeguards and Security). Jul 1983. 24p. NTIS, PC A02/MF A01. Order Number DE84002221.

This report covers data for the period from April 1, 1982, through September 30, 1982, and includes accounting corrections for data from earlier periods. These data and explanations, together with the absences of physical indications of any theft attempt, support a finding that during this period no theft or diversion of strategic special nuclear material has occurred.

2057 **(GAO/RCED—83-48) Regional low-level radioactive waste disposal sites: progress being made but new sites will probably not be ready by 1986.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 11 Apr 1983. 65p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Currently, three sites in Nevada, South Carolina, and Washington are used to dispose of all this country's commercial low-level nuclear wastes - materials contaminated with relatively low levels of radioactivity. The Low-Level Radioactive Waste Policy Act of 1980 encouraged the states to form interstate compacts and establish new, regional, low-level waste disposal sites by January 1, 1986. GAO found, however, that new disposal sites will probably not be ready to operate in most regions until sometime between 1988 to 1990. To resolve this time difference, the Federal Government could either extend the 1986 date or open existing Department of Energy disposal sites for commercial waste disposal. Currently, Department of Energy sites receive low-level wastes generated only by nuclear defense activities. On the other hand, states could temporarily keep the three existing commercial disposal sites open to all states or store low-level wastes in centrally located, warehouse-type facilities until new disposal sites are opened. These last two options maintain the states' responsibility in the area and, GAO believes, are more in line with the intent of the Low-Level Radioactive Waste Policy Act.

2058 **(INIS-mf—8613) Order of 9 November 1981 on exemptions from the Radioactive Substances Act.** (Denmark). 21 Nov 1981. 1p. (In Danish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704410.

Published in the Danish Official Gazette Part A, No. 82.

This Order was made under Act No. 94 of 31 March 1953 concerning radioactive substances and exempts certain radioactive materials from the licensing system laid down by the Act. The Order, which came into force on 1 January 1982, repeals Order No. 127 of 31 March 1953 concerning such exemptions. (NEA).

2059 **(INIS-mf—8618) Decree No. 82-1050 of 13 December 1982 creating a Central Service for repression of illicit trading in weapons, munitions, explosive products and nuclear, biological and chemical materials.** (France). 15 Dec 1982. 2p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704428.

Published in the French Official Gazette.

The Central Service was set up within the Ministry of the Interior and is responsible for the protection of the State and the national territory against criminal attempts, conspiracies and acts of terrorism and is vested with the necessary powers to discharge its duties. It co-operates with the other departments concerned in the study of measures to prevent unlawful use of weapons and nuclear materials. (NEA).

2060 **(INIS-mf—8623) Decree of 25 September 1982 amending Ministerial Decree of 27 July 1966 on conditions for notifying possession of radioactive materials and for annual updating of records thereof.** (Italy). 16 Oct 1982. 4p. (In Italian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704411.

Published in the Official Gazette (No. 286).

This Decree issued by the Ministry of Industry, Commerce and Crafts, amends a similar one of 27 July 1966 made in implementation of Presidential Decree No. 185 of 1964 on radiation protection. This new Decree simplifies the notification procedures. (NEA).

2061 **IAEA experience with authentication of in-plant NDA instrumentation.** Augustson, R.H. (Los Alamos National Lab., NM (USA)); Dermendjiev, E. (Bylgarska Akademiya na Naukite, Sofia. Inst. za Yadrena Izsledvaniya i Yadrena Energetika); Dahn, E. (International Atomic Energy Agency, Vienna (Austria)). pp 13-23 of Nuclear safeguards technology 1982. Proceedings of an international symposium on recent advances in nuclear material safeguards organized by the IAEA and held in Vienna, 8-12 November 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-821119—; IAEA-SM—260/1).

From International symposium on recent advances in nuclear materials safeguards; Vienna, Austria (8 Nov 1982).

The paper discusses IAEA experience with permanently installed measuring equipment, i.e. in-plant NDA instrumentation, which often has advantages over portable equipment, such as improved accuracy, automated sample handling and data collection, and capacity for higher throughput. In some cases, in-plant equipment is the only means of making a field measurement. However, the use of in-plant equipment requires an additional set of inspector procedures to ensure that the instrument is working correctly and has not been tampered with. This process of verifying instrument performance is called authentication. General guidelines for approaches to authentication have been studied and formulated by an IAEA Advisory Group Meeting held in November 1981. Procedures for specific instruments have been developed in some cases with the help of national support programmes. The field application of authentication is accomplished by incorporating specific actions into inspection procedures. Results are written down as part of the working papers and included in the final inspection report. For quantitative checks such as measurement of a working standard the results are sent along with the inspection measurements to the Agency for inclusion in the safeguards data base. The in-plant equipment may be owned by the facility, a State, a safeguards organization or the Agency. In each case, the use of the in-plant equipment will necessitate additional interactions between facility operator and inspector, in order to judge the impact on plant operation, and understand what is being measured and what can go wrong. The paper discusses the IAEA's experience gained in the field application of authentication procedures for instrument systems such as weighing and volume measuring devices, rod scanners, neutron activation systems and K-edge densitometers.

2062 **Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies.** Menlove, H.O. (Los Alamos National Lab., NM (USA)); Keddar, A. (International Atomic Energy Agency, Vienna (Austria)). pp 105-119 of Nuclear safeguards technology 1982. Proceedings of an international symposium on recent advances in nuclear material safeguards organized by the IAEA and held in Vienna, 8-12 November 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-821119—; IAEA-SM—260/104).

From International symposium on recent advances in nuclear materials safeguards; Vienna, Austria (8 Nov 1982).

An active neutron interrogation technique has been developed for the measurement of the $^{235}U$ content in fresh fuel assemblies. The method employs an AmLi neutron source to induce fission reactions in the fuel assembly and coincidence counting of the resulting fission reaction neutrons. When no interrogation source is present, the passive neutron coincidence rate gives a measure of the $^{238}U$ by the spontaneous fission reactions. The system can be applied to the fissile content determination in fresh fuel assemblies for accountability, criticality control, and safeguards purposes. Field tests have been performed by International Atomic Energy Agency (IAEA) staff using the Coincidence Collar to verify the $^{235}U$ content in light-water-reactor fuel assemblies. The results gave an accuracy of 1-2% in the active mode ($^{235}U$) and 2-3% in the passive mode ($^{238}U$) under field conditions.

2063 **Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material.** Kruse, L.W.; Dominguez, B. (Sandia National Laboratories, Albuquerque, New Mexico). *Nuclear Materials Management;* XI: No. 4, 42-47(Dec 1982).

A study was made of alternative designs for the portal detection of special nuclear material. Changes in the detector, signal-processing, and alarm logic components improve detection sensitivity and make the system less prone to false alarms. The resulting performance complies with the criteria for allowable frequency of false alarms specified by the Nuclear Regulatory Commission.

2064 **Attributes mode sampling schemes for international material accountancy verification.** Sanborn, J.B. (Brookhaven National Laboratory, Upton, New York). *Nuclear Materials Management;* XI: No. 4, 34-41(Dec 1982).

This paper addresses the question of detecting falsifications in material balance accountancy reporting by comparing independently measured values to the declared values of a randomly selected sample of items in the material balance. A two-level strategy is considered, consisting of a relatively large number of measurements made at low accuracy, and a smaller number of measurements made at high accuracy. Sampling schemes for both types of measurements are derived, and rigorous proofs supplied that guarantee desired detection probabilities. Sample sizes derived using these methods are sometimes considerably smaller than those calculated previously.

2065 **Measures for increasing IAEA safeguards effectiveness.** Hatcher, C.R. (Los Alamos National Laboratory, Los Alamos, New Mexico). *Nuclear Materials Management;* XI: No. 4, 22-28(Dec 1982).

The effectiveness of International Atomic Energy Agency (IAEA) safeguards depends not only on the quality of IAEA inspection and independent verification of declared nuclear material and facility use, but also on the perception of and reaction to IAEA safeguards by the nations who make up the international community. Because perceptions and reactions often involve nontechnical as well as technical factors, it has proven difficult to describe IAEA safeguards effectiveness in quantitative technical terms. This study uses a flow diagram to examine how IAEA inspections and the resulting verification statements lead to the main political objectives of IAEA safeguards, assurance and deterrence. Based on this approach, a figure of merit called the IAEA safeguards effectiveness ratio is defined, and measures for increasing IAEA safeguards effectiveness are identified and discussed.

# 06 FUSION FUELS

## 0602 Processing

*REFER ALSO TO CITATION(S) 1928, 4159*

## 0604 Transport And Storage

*REFER ALSO TO CITATION(S) 4159*

## 0605 Health And Safety

*REFER ALSO TO CITATION(S) 2060, 4159*

## 0607 Waste Management

*REFER ALSO TO CITATION(S) 4159*

2066 **(PNL-SA—11441) Potential low-level waste disposal limits for fusion radionuclides.** Kennedy, W.E. Jr.; Mann, F.M. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1983. Contract AC06-76RL01830. 7p. (CONF-831047—95). NTIS, PC A02/MF A01. Order Number DE84002587.

From American Nuclear Society winter meeting; San Francisco, CA, USA (30 Oct 1983).

Low-level waste disposal limits are presented for ten radionuclides of potential concern for the fusion fuel cycle that are currently mentioned in 10 CFR Part 61.

## 0608 Properties

2067 **p-$^{11}$B multipole evaluation.** Gordon, J.D.; Samec, T.K.; Hauss, B.I. (TRW, Inc., Redondo Beach, CA (USA)) (and others). pp 47-62 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/38).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

The burn characteristics of the p-$^{11}$B alternate fuel fusion cycle have been evaluated and preliminary conceptual designs of key subsystems for an alternate fuel multipole reactor completed. The burn analysis results show that nuclear elastic scattering does not create a sufficiently large non-Maxwellian hot ion tail to cause significant reactivity enhancement. The moderate reactivity enhancement, when coupled with synchrotron losses, does not allow ignition or high gain operation of the cycle. The importance of plasma reabsorption and high wall reflectivity in reducing synchrotron losses has been shown. Neutron yield for the cycle is dominated by fast $\alpha$-$^{11}$B reactions and account for less than 0.16% of the energy release. Tritium inventory is negligible. However, radioactive $^{11}$C, produced by a low probability fusion reaction, reaches an equilibrium level of 1.7x10$^{6}$ Ci/GWsub(f). The radiological hazard of the cycle, caused by neutron activation and radioactive products, while being orders of magnitude lower that that of D-T, still requires serious consideration in the reactor design. To achieve an adequately large fusion power density, the multipole must have approximately equal currents in the inner and outer rings as opposed to the standard design where the outer ring current is half that of the inner ring. The device beta limit is a critical unresolved issue. A method to enhance thermal helium ash leakage is shown to be needed. Very high current levitated superconducting coils have been designed to operate in the low neutron and high heat flux environment. A pump limiter and vacuum system design are shown to be compatible with an alternate fuel multipole. A TZM first wall has been designed to allow limited hands-on maintenance forty-five days after a reactor shut down. A 41% efficient conventional superheat cycle with both boiling and superheating in the tube bank first wall is the power cycle.

# 07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

## 0701 Physical Isotope Separation

*REFER ALSO TO CITATION(S) 1917*

2068 **Availability of enriched isotopic material for accelerator targets.** Newman, E. (Operations Divisions, Oak Ridge National Lab, Oak Ridge, TN 37830). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* 30: No. 2, 1573-1574(Apr 1983).

The electromagnetic isotope enrichment facility at the Oak Ridge National Laboratory provides a broad spectrum of highly enriched stable isotopes to the worldwide scientific community. The continued timely availability of these materials is of vital importance in many areas of basic research and, in particular, as source material for the fabrication of accelerator targets. A brief description of the facility and its capabilities and limitations is presented.

2069 **Feed cycles for the industrial production of heavy water through multiphoton dissociation of fluoroform.** Bigeleisen, J.; Hammond, W.B.; Tuccio, S. (State University of New York, Stony Brook, New York 11794). *Nuclear Science and Engineering;* 83: No. 4, 473-481(Apr 1983).

It is shown experimentally that fluoroform undergoes rapid protium-deuterium exchange with ammonia, methylamine, and cyclohexylamine in the presence of the respective conjugate bases of these protolytic solvents. Equilibrium protium-deuterium separation

factors between fluoroform and water, ammonia, methane, ethane, and hydrogen at 25°C are calculated from molecular data. Schematic feed cycles are developed from these data to provide the feed for a commercial deuterium laser isotope separation plant using fluoroform under recycle as the working medium. Feed cycles considered are based on hydrogen, ammonia, or water as feedstocks. It is shown, from simple qualitative considerations, that hydrogen gas presents many advantages over the use of ammonia or water as feedstock material. Its only disadvantage is the limited production of $D_2O$ that can be realized in a plant operating on satellite hydrogen.

2070 **Status and prospects for lasers in isotope separation.** Davis, J.I.; Holtz, J.Z.; Spaeth, M.L. (Lawrence Livermore National Laboratory, Livermore, CA). *Lucas Engineering Review;* **18**: No. 9, 49-54(Sep 1982).

The AVLIS program is both important to and illustrative of the general application of lasers in chemistry. This paper gives some perspective on how long it takes to get a process into production and shows what the authors think might happen in the future. Lasers were first operated in 1960; within the next decade, tens of concepts had arisen for LIS and many other applications. The tunable dye laser was first operated in the late 1960s and that enhanced the prospects for using lasers in chemical applications. Scientific feasibility for uranium LIS was demonstrated in the early 1970s. Development of the process and investigation of the economic potential were continued throughout the 70's. Intensive economic analyses have been performed in the last few years and expect soon to go into a very intensive engineering effort leading to a production plant in the early 1990s. The authors believe there will be in the next decade a much more orderly scientific evaluation of industrial photochemistry. There was a certain amount of euphoria in the 1970s that is beginning to wear off, but the authors believe there will be more fruitful research in the 1980s and there will be enough major applications of lasers once they have undergone careful examination. The authors can expect in the 1990s to see industrial photochemistry emerge. AVLIS is expected to be the first use of lasers on a large industrial scale, and the authors believe it will help the general acceptance of laser technology by the chemical industry and the general acceptance across the board of laser technology in commercial processes.

### 0702 Radiation Sources

*REFER ALSO TO CITATION(S) 3124*

2071 **(GEPP-TIS—761) Troubleshooting the General Electric Company Neutron Devices Department's deionized water system.** Gillespie, T.J. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 15 Nov 1983. Contract AC04-76DP00656. 31p. NTIS, PC A03/MF A01. Order Number DE84002960.

In May 1982, the General Electric Neutron Devices Department's deionized (DI) water system was found to be highly contaminated with fresh water roundworms which caused severe filter plugging problems. Subsequently, a DI water improvement program was developed by GEND's Process Technology, Contamination Control, and Facilities Engineering groups. This program included removal of dead ends in the distribution system, a consultant's review, significant modification of the DI water system, modification of system operation, design of a quality plan, and changes in the types of water analysis. During implementation of the improvement program, a severe bacteria contamination problem occurred due to a contractor accident. Correction of this problem required sterilization of portions of the DI water system and significant modification of the water filtration system. The system modifications and sterilization procedures have significantly reduced bacteria and total solids contamination while resistivity is generally increasing.

2072 **(SAND—82-0998) Cesium-137 gamma-source considerations for dry-sludge irradiators.** McKeon, D.; Hartwigsen, C.C.; Zak, B.D. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1983. Contract AC04-76DP00789. 57p. NTIS, PC A04/MF A01. Order Number DE84002165.

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This report reviews source design considerations in Cs-137 sludge irradiators. It is intended to guide future irradiator designers to areas of source design where significant gains in source utilization efficiency can be made. It also notes areas where further work is not likely to be fruitful. Detailed calculations have been performed for the Sandia Irradiator for Dried Sewage Solids (SIDSS) as it presently exists, as well as for several hypothetical upgrade designs. The calculations for the present design are compared with measurements to establish confidence in the calculations.

## 08 HYDROGEN

### 0801 Production

*REFER ALSO TO CITATION(S) 2109, 2125, 2129, 2517, 2518, 3388*

2073 **ESR study of cation-crown ether induced dimerization of a water-soluble porphyrin.** Chandrashekar, T.K.; van Willigen, H. (Univ. of Massachusetts, Boston). *Journal of the American Chemical Society;* **105**: No. 20, 6323-6324(5 Oct 1983). Contract AC02-81ER10911.

The ESR spectra of photoexcited triplets of tetra(4-sulfonatophenyo)porphyrin ($H_2$(TPPS)) are shown as recorded in frozen water/glycerol at 100°K. Addition of cations, sodium and potassium ($K^+$) results in the loss of the monomer signal and the appearance of a triplet signal attributed to the dimer. For a $H_2$(TPPS) concentration of 5 x $10^{-4}$M, a $K^+$ concentration in excess of $10^{-1}$M is required for complete dimerization. In the presence of $K^+$, the addition of excess 18-crown-61 ether shifts the equilibrium toward dimerization. 1 figure.

### 0802 Storage

2074 **(PB—83-251488) Investigation into hydrogen storage with cryoadsorbents and comparison of alternative hydrogen storage methods.** (Commission of the European Communities, Luxembourg). [nd]. 136p. (EUR—8025-DE). NTIS, PC E07/MF E07.

In continuation of an earlier experimental program for a small-scale cryoadsorber installation, further development was involved. Based on the experimental work, the storage of hydrogen in larger storge equipment with cryoadsorber reservoirs is studied. The storage costs of the different methods for hydrogen storage for different working conditions are compared.

2075 **The kinetics of hydrogen absorption-desorption by metals.** Pick, M.A. (Brookhaven National Lab., Upton, NY). pp 329-343 of Metal hydrides. Bambakidis, G. (ed.). New York, NY; Plenum Publishing Corp. (1981).

The rate at which hydrogen can be absorbed and desorbed by a particular metal or alloy is an important factor for hydrogen storage. It can be decisive in the question of whether it is a useful material. Many properties influence the kinetics including: the diffusion coefficient of hydrogen; the sample size or surface-to-volume ratio; the occurrence of phase transitions; the heat of solution, and related to that, the rate at which this heat can be extracted or provided during the absorption and desorption cycles respectively. Some of these factors have been dealt with in more or less detail in the past. One factor which has received relatively little attention is the intrinsic rate of hydrogen transfer through the solid-gas interface; the surface. The present paper reviews some experimental studies and a theoretical model for the potential energies involved with the hydriding-dehydriding process. It will first discuss the theoretical model in detail, then, show how it applies to the model substances Nb and Ta and how two major predictions of the model are fulfilled. One of the predictions deals with the surface modifications which can enhance the hydrogen uptake rate and a second one with the temperature, coverage and pressure dependence of the sticking coefficient.

## 0808 Properties

*REFER ALSO TO CITATION(S) 2077*

# 09 OTHER SYNTHETIC AND NATURAL FUELS

## 0901 Hydrocarbon Fuels

*REFER ALSO TO CITATION(S) 1775, 1775, 2108, 2988, 2995*

2076 **(DOE/PC/41265—T1) Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report.** Mulay, L.N. (Pennsylvania State Univ., University Park (USA). Materials Research Lab.). Aug 1982. Contract AC22-81PC41265. 31p. NTIS MF A01. Order Number DE84001112.

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This work was undertaken using Moessbauer spectroscopy to characterize supported iron catalysts such as Fe/ZSM-5, Fe/Silicalite, and Fe/Mordenite in the synfuel gas reaction. The conclusions are as follows: (1) The catalysts prepared using $Fe_3(CO)_{12}$ impregnation on ZSM-5 showed $\gamma$-$Fe_2O_3$ with better dispersion and smaller particle size which led to high surface area. (2) The $H_2$ flow rate varied the $Fe_3O_4$ content at the reduction stage. Under normal reduction conditions, the reduction is completed in two hours. High $H_2$ flow is suggested in order to obtain complete reduction. (3) The carbided catalyst with carbonyl impregnation showed no phase change in the synfuel gas reaction. This confirmed that the catalysts were very stable and the activity obtained from PETC samples at 300°C was mainly due to the temperature effect. (4) Low activity of iron on Mordenite catalyst resulted possible from the extensive oxidation of the carbided catalyst. (5) The catalysts prepared using $Fe_3(CO)_{12}$ impregnation on Mordenite with various $SiO_2/Al_2O_3$ ratio showed $\gamma$-$Fe_2O_3$ with various isomer shift arising from the change of chemical environment. This is an evidence of strong metal support interaction (SMSI) due to the acidity of the catalyst support. 9 references, 17 figures, 3 tables.

2077 **(FFI-TN-VM—64) Charcoal as an alternative energy carrier. Pt. 4: Systems studies.** Andersen, S.; Rustad, S. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Jun 1979. 32p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751468.

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The report discusses the system of converting wood into thermal energy, using charcoal as an intermediate energy carrier. The main system is divided into four parts: logging, pyrolyzing to charcoal, plus refining and distribution of charcoal to the consumer. The purpose of the study is to estimate the energy cost, employment potential for the system, energy conversion efficiency and any ecological consequences connected to intensive forest utilization. Several cost estimates with a considerable degree of uncertainty have been used, and this must be appreciated. The most important energy cost factor is the price of wood, which in this case represents between 60 and 80% of the total energy cost. The pyrolysis process efficiency has also a great impact on energy cost. Using the most economic process (the mobile Cornell batch retort), the total cost of thermal energy including distribution and 20% combustion loss in the costumer's heating system has been founded to be about 16-20 oere/kWh. Use of biomass from forests in energy production may create about 4500 new jobs, about 2500 of them in the forests. Total system energy conversion efficiency is about 0.5 and the ratio between used and produced energy is 0.17. (This last ratio is, however, about 4 times the ratio of hydroelectric energy.) The consequences of most concerns for ecology through extensive use of forest energy are the effects on soil fertility. As yet not enough research material is available to evaluate these long-term effects.

2078 **(FFI-TN-VM—350) Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass.** Holstad, A. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Dec 1978. 85p. (In Norwegian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751470.

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Terrestrial biomass, residues from forestry, agriculture and farming can be converted by biochemical or thermochemical techniques to fuels. The charcoal yield depends on the raw materials, moisture contents, the temperature of carbonisation and the processing equipment. The yield is reduced by 2 - 3% when using softwood and furthermore with higher temperature of carbonisation. Generally charcoal contains 80 - 90% carbon, 0,5 - 10% ash and 7 - 30% volatile matter. Theoretically the following products are obtained when pyrolising wood: 34,7% Charcoal, 24,9% $H_2O$, 10,9% $CO_2$, 4,15 CO, 1,6% Methanol, 5,9% Acetic Acid and 17,9% Tar. Units for production of charcoal are large and small kilns, transportable Thomas retorts and Cornell retorts with a production of 1,3 - 6 tons charcoal/day, and the large Lambiotte retort, multiple-hearth furnaces and fluidized-bed reactors. Interesting is also the new equipment of Skogens Kol in Sweden. These large units have a production capacity of 16 - 80 tons charcoal/day. Important production parameters include charcoal yield, labour requirements, air pollution and cost. Based on these parameters the Cornell retort is considered the best unit for production of small quantities of charcoal and Skogens Kol seems to be the most interesting large unit. 17 drawings, 14 tables.

2079 **(FFI-TN-VM—352) Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products.** Olsen, T. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Dec 1978. 42p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751469.

Charcoal as an energy carrier for domestic heating is investigated. Four various forms of charcoal fuels are considered together with applicable furnaces. Different ways of using the by-products from wood pyrolysis are investigated. Process of fractionating equipment for by-products, grinding mills and briquetting plants are listed together with energy- and labour requirements. The expences of the purification processes for charcoal and by-products are estimated. Possible compounds in the flue gas from charcoal production and firing and their environmental influence are discussed. 4 drawings, 6 tables.

2080 **(PB—83-242636) Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82.** Biljetina, R.; Chynoweth, D.P.; Janulis, J.; Srivastava, V.J. (Institute of Gas Technology, Chicago, IL (USA)). May 1983. 104p. NTIS, PC A06/MF A01.

The objective of this research is to develop efficient processes for conversion of biomass-waste blends to methane and other resources. To evaluate the technical and economic feasibility, an experimental test facility (ETU) is being designed and installed at the Reedy Creek Wastewater Treatment Plant at Walt Disney World, Orlando, Florida. The facility will integrate a biomethanogenic conversion process with a waste-water treatment process employing water hyacinth ponds for secondary and tertiary treatment of sewage produced at Walt Disney World. The ETU will be capable of feeding 1-wet ton per day of water hyacinth-sludge blends to the digestion system for production of methane and other byproducts. The detailed design of the facility has been completed and procurement of equipment is in progress.

2081 **(PB—83-249490) Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83.** Frese, K.W. Jr; Canfield, D. (SRI International, Menlo Park, CA (USA)). Mar 1983. 62p. NTIS, PC A04/MF A01.

To investigate the electrochemical mechanism of reduction of CO2 or carbonate species to useful fuels e.g., methanol and methane by means of sunlight and semiconductor electrodes. Carbon dioxide is an abundant raw material that may be used as a source of inorganic carbon. By suitable electrochemical processes this inorganic carbon may be converted to organic carbon in the form of methanol and methane, which could be used as a fuel. Such electrochemical conversions can be made to occur at semiconductor electrodes. In addition, semiconductor electrodes absorb light, and this light can be converted to a voltage that causes the electrochemical transformations of interest. By combining the CO2, water, semiconductor, and sunlight, we can store solar energy in the fuel. The end result is a method to upgrade the products of ordinary

combustion, namely CO2 and H2O, by returning them to useful fuels. This research program consists of a study of the electrochemical and solid state aspects of the conversion of CO2 to fuels at semiconductor electrodes.

2082 **(PB—83-249516) Fischer-Tropsch catalysis. Annual report 1 Jun 81-31 May 82.** Andersen, R.A. (California Univ., Berkeley (USA). Dept. of Chemistry). Jun 1982. 17p. NTIS, PC A02/MF A01.

Fischer-Tropsch catalysis, a heterogeneous catalytic reaction that converts carbon monoxide and hydrogen (the synthesis gas produced in coal gasification) to organic alcohols and hydrocarbons, is an old though not understood reaction. This lack of mechanistic understanding prevents the design of new and better catalytic systems. The approach is to use homogeneous systems to model two fundamental reactions important in Fischer-Tropsch chemistry: insertion of carbon monoxide into a metal-carbon bond and carbon-carbon bond formation.

2083 **(PB—83-256644) Vapor liquid equilibrium study of the $H_2CH_4$ system at low temperatures and elevated pressures. Research report (annual) Jan-Dec 79.** Hong, J.H.; Kobayashi, R. (Gas Processors Association, Tulsa, OK (USA)). Dec 1980. 31p. (RR—46). NTIS, PC A03/MF A01.

The binary hydrogen-methane study summarized in RR-46 presents the initial results of a comprehensive experimental program to study the hydrogen-carbon monoxide-methane ternary and binary systems. This system is of paramount importance in the production of substitute natural gas. The hydrogen-methane binary was studied in detail because published data appeared inconsistent or unreliable. Less detail is anticipated for the study of the remaining binaries and ternary which will be reported in a subsequent RR. The current data are directly applicable to process and separation designs. The ultimate goal of this program is to provide sufficient and adequate data from which equilibria correlations may be extended or improved.

2084 **(PB—83-256677) Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82.** Kobayashi, R. (Rice Univ., Houston, TX (USA)). 1980. 18p. NTIS, PC A02/MF A01.

Reliable methods of predicting the physical properties of natural gas mixtures are necessary for metering and in designing transport, separation and purification equipment associated with gaseous fuels. This need is particularly pronounced in view of the wide range of conditions which are met in practical applications, and it is growing increasingly important as the prospect of recovering and processing less conventional gas supplies grows more urgent. The separation of synthesis gas consisting of various concentrations of hydrogen and carbon monoxide from methane and other light hydrocarbons is a major step in the manufacture of SNG from coal. Since the separation(s) must be conducted at cryogenic temperatures, it is energy intensive. If accurate data are not available at the design state, gas recovery and processing facilities may be overdesigned, with large cost increases for the gas industry and ultimately the gas consumer. This grant is collecting data which are useful for design purposes, but which also provide critical tests of predictive equations for fluid mixtures.

2085 **(PB—83-256685) Marine biomass program: anaerobic digestion systems development and stability study. Final report 1 Feb-31 Dec 82.** Fannin, K.F.; Srivastava, V.J.; Mensinger, J.D.; Chynoweth, D.P. (Institute of Gas Technology, Chicago, IL (USA)). Jul 1983. 150p. NTIS, PC A07/MF A01.

Marine biomass represents a significant potential worldwide energy resource that can be converted to methane by anaerobic digestion. Through efficient biomass production, harvesting, and conversion techniques, competitive methane gas costs are achievable. The objective of this research project is to develop and define an anaerobic digestion process for producing methane from giant brown kelp (Macrocystis pyrifera). Kelp continues to show superior performance as a feedstock for gas production when compared with other particulate biomass feedstocks. Further work on upflow solids reactors and two-phase reactor systems is expected to improve gas cost estimates over those made using other state-of-the-art reactors.

2086 **(PNL-SA—11447) Overview for DOE's Biomass Thermochemical Conversion Program.** Schiefelbein, G.F. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1983. Contract AC06-76RL01830. 19p. (CONF-8310195—1). NTIS, PC A02/MF A01. Order Number DE84002595.

From Industrial wood energy forum; Nashville, TN, USA (15 Oct 1983).

An overview is presented of research and development projects sponsored by the Biomass Thermochemical Conversion Program. Currently, this research can be divided into five areas: innovative combustion technology, gasification technology, pyrolysis technology, direct liquefaction technology, and fundamental research on reaction mechanisms, kinetics and thermodynamics. Pacific Northwest Laboratory (PNL) as the Lead Laboratory has responsibility for overall field management of the Program. These responsibilities include project selection, contract procurement, project monitoring and program planning.

2087 **Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis.** Chen, Y.W.; Wang, H.T.; Goodwin, J.G. Jr. (Univ. of Pittsburgh, PA). *Journal of Catalysis;* **83**: No. 2, 415-427(Oct 1983). Contract FG22-81PC40774.

Three preparation techniques [incipient wetness using a solution of ruthenium chloride ($RuCl_3$), vapor impregnation by the ruthenium carbonyl [$Ru_3(CO)_{12}$], and ion exchange with $Ru(NH_3)_5Cl_3$] have been used to prepare sodium (Na)Y zeolite-supported ruthenium catalysts. The effect of these preparation methods on the activity and product selectivity of the Ru catalysts in the Fischer-Tropsch synthesis was examined at temperatures in the range of 220 to 320°C, a pressure of 1 atm, a $CO/H_2$ ratio of 1, and flow rates in the range GHSV = 1800 to 3600 $h^{-1}$. It was found that there is a good inverse correlation of turnover numbers for CO conversion to the CO/H adsorption ratio, suggesting that the relative availability of adsorbed $H_2$ and CO determines catalyst activity during reaction. Selectivity in the Fischer-Tropsch synthesis was greatly influenced by the preparation method and metal loading. Catalysts prepared by incipient wetness produced mainly methane. Catalysts prepared by vapor impregnation had the best selectivities for higher hydrocarbons and olefins even though they had the smallest average Ru particle sizes. The observed changes in adsorption, activity, and selectivity with preparation method appear to result from differences produced in metal location in/on the zeolite, metal particle size, and zeolite-metal interactions. 12 figures, 2 tables.

2088 **Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy.** Kelley, R.D.; Cavanagh, R.R.; Rush, J.J. (National Bureau of Standards, Washington, DC). *Journal of Catalysis;* **83**: No. 2, 464-468(Oct 1983).

Neutron inelastic scattering (NIS) has been used to monitor vibrational modes during the adsorption and reaction of hydrogen and CO on Raney nickel. Evidence for a temperature dependent hydrogen/CO interaction is observed. The results show that CO coadsorbed in equivalent amounts with a saturation layer of H at 80 K has little impact on the H vibrational spectrum and thus on the force constant or configuration of the threefold binding sites occupied by hydrogen. Raising the temperature of the CO + H layer to 295 K shows significant H-CO interactions. Preliminary NIS experiments for $H_2/CO$ gas mixtures under flow conditions indicate that the adsorbed layer present under reaction conditions, i.e., during substantial (~ 50%) conversion of CO to hydrocarbons (450 K) is dominated by the same adsorbates which are found under non reactive (i.e., no conversion of CO to hydrocarbons) conditions (300 K). 3 figures.

## 0902 Alcohol Fuels

*REFER ALSO TO CITATION(S) 1875, 2075, 2076, 2128, 2995*

2089 **(DOE/ID—10115) Alcohol-Fuel-Technology Grant Program: an evaluation and summary.** (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1983. Contract AC07-76ID01570. 86p. NTIS, PC A05/MF A01. Order Number DE84002765.

This report summarizes the research projects with respect to one of five process areas into which each was grouped. The process areas are feedstock preparation, feedstock conversion, product recovery, byproduct recovery, and end use. These areas encompass the conversion of biomass to fuels and the consumption of the fuels. In each of these process areas there are research needs which, if achieved, will provide improved economic feasibility for production. These needs revolve around improved alternate feedstocks, better conversion, lower energy, recycling of the biocatalysts, reduced energy input, less capital intensive recovery of byproducts and expanded byproduct markets. All of the short term projects in this program have directed these investigations to one of these needs. Some of these projects have achieved breakthroughs or shown insight into achieving an improved process. A more detailed technical abstract of each project is available in the Appendix. Within these reviews, the uniqueness of the individual project and its accomplishments are discussed.

2090 **(SERI/TR—231-2000) Value of furfural/ethanol coproduction from acid hydrolysis processes.** Parker, S.; Calnon, M.; Feinberg, D.; Power, A.; Weiss, L. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1983. Contract AC02-77CH00178. 125p. NTIS, PC A06/MF A01. Order Number DE84000007.

The benefits of two modifications in the acid hydrolysis of cellulosic feedstocks for the production of ethanol fuels were investigated: marketing of the by-product furfural and xylose fermentation. Preliminary analysis indicate that the furfural by-product furfural and xylose fermentation. Perliminary analyses indicate that the furfural by-product credit is more beneficial at a minimum net profit of $0.08/lb of furfural. For this credit to have a major impact on ethanol production costs, new markets for large quantities of furfural must be identified. Furfural can be an alternative feedstock for hydrocarbon-based commodity chemicals. The costs and profitabilities of producing five chemicals from furfurals as opposed to conventional hydrocarbon-based feedstocks were studied. The furfural processes for production of styrene and butadiene were found to be marginally competitive or not competitive. The furfural processes for adipic acid, maleic anhydride, and butanol could be competitive. Results of analysis by a computer model of the petrochemical industry indicate that with furfural markets additional to these three furfural processes, over 2.5 x $10^9$ gal of ethanol could be marketed at about $1.00/gal. Converting the xylose stream to ethanol has about the same effect on the selling price of ethanol as the furfural credit. The greatest ethanol production will result from xylose fermentation, but the furfural credit offers large near-term profits and has a more diversified impact on reducing petroleum product demand. 6 figures, 17 tables.

## 0903 Inorganic Hydrogen Compound Fuels

2091 **Phase diagram and transition properties of condensed ammonia to 10 kbar.** Mills, R.L.; Liebenberg, D.H.; Pruzan, P. (Los Alamos National Lab., NM). *Journal of Physical Chemistry;* **86**: No. 26, 52119-5222(23 Dec 1982).

A piston-cylinder apparatus was used to measure the transition curves and corresponding volume changes in condensed $NH_3$ from 200 to 305 K (0.9-10.5 kbar). The melting curve has two distinct branches: a lower one bounding solid I and an upper one bounding solid II. The two melting curves intersect at 217.34 K (3.070 kbar), forming a solid I-solid II-liquid triple point. The solid I-solid II transition line was determined from the triple point up to 224 K (8.0 kbar). From sound-velocity measurements, it appears that ultrasonic signals are completely attenuated in both solids over wide P-T regions adjoining the melting curves.

## 0904 Solid Waste And Wood Fuels

*REFER ALSO TO CITATION(S) 2080, 2106*

2092 **(AD-A—130444/3) RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83.** Gardiner, G.H.; Chatterjee, A.K. (VSE Corp., Oxnard, CA (USA)). Jun 1983. 123p. NTIS, PC A06/MF A01.

This report addresses the economics of co-firing refuse derived fuel (RDF) in an fuel oil fired boiler. The report specifies the type of RDF required; the cost and type of modifications to the oil boiler; and the price which can be paid for RDF based on boiler size and RDF feedrate. Life cycle economic procedures are used to develop breakeven graphs of RDF price versus boiler size. A list of Navy oil boilers with the potentials of utilizing RDF is given.

2093 **(AD-A—131724/7) Survey completion report: residential fuelwood use in the United States: 1980-81.** Skog, K.E.; Watterson, I.A. (Forest Products Lab., Madison, WI (USA)). Jul 1983. 158p. NTIS, PC A08/MF A01.

This report presents results of a survey of U.S. households which determined fuelwood consumption and acquisition during 1980-81. Data on fuelwood consumption are given by regions, household characteristics, and selected economic factors. Data on household acquisition include amounts purchased and harvested and are given by region, species type, and source of fuelwood.

2094 **(FFI/Notat—80/4014) Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway).** Hohle, E.; Rustad, S. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Mar 1980. 21p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751467.

The report consists of a detailed evaluation of the possibilities for production and sales of charcoal in an appointed geographical region. Main questions in this connection are accessible resources of wood for the production; production costs; utilization of by-products (process heat, tar, flue gas etc.); refining- and distribution systems; employment market; energy account and environmental consequences. 3 drawings, 7 tables.

2095 **(FFI/Notat—80/4042) Pyrolysis tests with Cornell retort in production of charcoal.** Soma, M.; Olsen, T.; Engebretsen, H.; Rustad, S. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Jul 1980. 18p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751466.

A pilot plant for production of charcoal based on drawings of a Cornell-retort has been constructed and tested. The retort was modified and improved in order to find a pyrolysis system well suited Norwegian conditions. The tests indicated a yield of 35% by weight under optimum conditions, and the quality of the charcoal was very good. Flue gas seemed not to represent a serious problem, but its contents of polycyclic aromatic hydrocarbons should be determined. Total time for the pyrolysis in the pilot plant varied from 6 to 12 hours depending upon type of raw material and moisture content. 3 drawings , 4 tables.

2096 **(IS—4820-Vol.1-2) Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography.** Capellen, J.M.; Junk, G.A.; Fassel, V.A. (Ames Lab., IA (USA)). Dec 1982. Contract W-7405-ENG-82. 328p. NTIS, PC A15/MF A01. Order Number DE84002630.

Both Volumes I and II are contained in this document. Research areas recommended in Volume I for further investigations are: sampling equipment and procedures; identification and quantitation of emissions; indoor air quality; epidemiology; fundamental investigations of combustion; and use of coal. Volume II contains an extensive bibliography with over 500 citations relating to the residential combustion of wood. (DMC)

2097 **(IVA—236) Solid fuels technology in the 80s.** Ringstroem, B. (ed.). (Ingenjoersvetenskapsakademien, Stockholm (Sweden)). 1983. 171p. (In Swedish). (CONF-830153—). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751426.

From Conference on solid fuels technology in the 80s; Stockholm, Sweden (25 Jan 1983).

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The development of burning facilities for solid fuels as presented at an IVA symposium on January 25, 1983 is reported. As this sector has not been expanding as fast as expected, there is a risk that the goal set out for the 1990 use of solid fuels will never be reached. The low expansion rate is not due to lack of fuels, although certain quality problems remain to be solved. So, for example, is the production and use of peat still quite modest. To realize the 1990 goal, new heating projects will have to be started on a large scale in the next few years. The construction of coal burning facilities has just begun and it is promoted by low coal prices. Both technological and economic factors have caused the slow expansion. Other reasons are the prevailing uncertainty regarding the supply of fuels and the feasibility of combining new fuels with existing furnaces. Another factor delaying the local authorities planning for energy supply and demand is the growing number of new energy technologies. Such problems can be reduced, though, thanks to the present development of heating technologies, such as quick fluidized beds and systems for effective burning of solid fuels.

2098 **(STF—15A81020) Meeting on solid fuel room heaters. Testing for efficiency and safety.** Soenju, O.K.; Klausen, T. (SINTEF, Trondheim (Norway)). Jun 1981. 186p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751460.

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The main goal of the meeting was to discuss testing procedures, standards, and trends of the future for solid fuel room heaters. The production and use of solid fuel room heaters are increasing at a rapid rate on a world wide scale, and it was felt that it would be very beneficial for experts on this subject from various countries to meet and exchange information and experience. A further goal of the meeting was to start some cooperative work on an international basis in this area. Senior staff members from research testing laboratories and governmental institutions in U.S., U.K., West-Germany, Denmark, Sweden, Finland and Norway perticipated. The report includes: A list of attendees, minutes of the meeting, notes taken during the meeting, correspondence, and papers/notes presented at the meeting. The technical papers/notes include the following topics: testing of solid fuel room heaters, measuring techniques and testing methods, safety testing, use of biomass, cooperative programs, and a paper on energy conservation in U.K. in relation to solid fuel room heaters. 37 drawings, 11 tables.

2099 **(VTT-TIED—164) Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples.** Nieminen, M.; Ranta, Y. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Nov 1982. 54p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Instructions are given for the determination of the most significant combustion-technical characteristics of indigenous fuels. Preparation of different fuels for laboratory testing is also discussed. The instructions are based on international standardization (ISO, DIN, ASTM) and on the laboratory's own experience and method development work. The methods are applicable to solid fossil fuels. Experiments connected with the instructions were carried out with milled peat, sod peat, peat and wood pellets, fuel chips and coal.

# 13 HYDRO ENERGY

## 1306 Environmental Aspects

2100 **(PB—83-251199) Effects of operating the Mt. Elbert Pumped-Storage Powerplant on Twin Lakes, Colorado: 1981 report of findings. Technical report.** LaBounty, J.F.; Sartoris, J.J. (Bureau of Reclamation, Denver, CO (USA). Engineering and Research Center). Dec 1982. 97p. (REC-ERC—83-2). NTIS, PC A05/MF A01.

A series of studies is being performed to identify and quantify changes that occur in the aquatic ecology of Twin Lakes, Colorado, because of the Mt. Elbert Pumped-Storage Powerplant, which began operation in August 1981. The results presented here are part of the investigations being done by the Bureau of Reclamation on the ecological effects of pumped-storage construction and operation. These studies have been going on since 1971. The Twin Lakes and the powerplant are being used for the primary field investigations. Although it is too early to identify any ecological changes, this report presents results of studies done in 1981. These results, along with those from other studies done since 1971 when the project began, are being used to define the preoperational limnology of Twin Lakes.

# 14 SOLAR ENERGY

## 1401 Resources And Availability

2101 **(EUR—8745-EN) Circumsolar sky radiation: the flux density of radiation energy originating from the circumsolar sky measured at groundbased stations. Final report.** Eiden, R. (Bayreuth Univ. (Germany, F.R.). Abt. fuer Meteorologie am Lehrstuhl fuer Hydrologie). 1983. 81p. European Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037.

The aim of this project was the measurement of the radiant energy flux provided by the diffuse radiation of the ring shaped area of the sky around the unmasked sun disk. More than 200 measurements of the irradiance of this circumsolar cloudy or cloudless sky up to an angular radius of 10° had been taken at Mainz (FRG), Deuselbach (FRG) and Adrano (Sicily). The measurements show that the irradiance of the circumsolar sky radiation may reach an amount of more than 30% of the direct solar irradiance at the observation site. This means, optical systems combining the direct solar radiation and the circumsolar radiation may compensate - at least partly - the extinction losses of the direct solar radiation by the turbid and cloudy atmosphere. The most distinct compensation effect will be observed in the presence of thin cloud layers. A unique relationship between the irradiance of the circumsolar sky and the direct solar irradiance or an equivalent nonspectral turbidity factor could not be found. To a certain extent this is possible for a turbid, cloudless atmosphere. It is not possible for a cloudy atmosphere, since clouds change the size distribution of their elements considerably with cloud type and lifetime.

2102 **Aggregation of U.S. population centers into climate regions.** Andersson, B.; Carroll, W.L.; Martin, M.R. (Univ. of California, Berkeley). pp 189-194 of Progress in passive solar energy systems. Hayes, J.; Winn, C.B. (eds.). New York, NY; American Solar Energy Society (1982). (CONF-820819—). Contract AC03-76SF00098.

From 7. national passive solar conference; Knoxville, TN, USA (30 Aug 1982).

A technique is described for aggregating U.S. population centers into regional groups which have similar climates. The technique involves: (1) the use of weather data for Standard Metropolitan Statistical Areas (SMSAs) to represent the climates of U.S. population centers; (2) the selection and quantification of weather parameters to represent the salient climate characteristics of each SMSA; (3) the sequential application of a decision-making procedure (with specifiable decision criteria) to each SMSA in order to determine which SMSAs group together to form a region; and (4) the use of population-weighted regional averages of each of the climate parameters to determine which single SMSA best represents the entire region. The value of the technique lies in its objectivity and flexibility in providing rational regional groupings for a wide range of specialized applications which can be explicitly defined by the user. For ease of use, the entire technique has been automated as an interactive computer program. Four examples of regional breakdowns obtained by this technique using different grouping criteria are presented and discussed.

## 1403 Economics

*REFER ALSO TO CITATION(S) 2147, 2570*

## 1404 Environmental, Legal, And Institutional Aspects

*REFER ALSO TO CITATION(S) 2593*

2103 (CONF-811288—, pp 107-125) **Building laws and regulations and the utilization of solar energy in the Federal Republic of Germany.** Weidlich, B. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Safeguarding insolation during seasons and times of the day is an important factor for active and passive utilization of solar energy. This contribution deals with the legal side of solar energy utilization. The consequences of the present legislation are outlined and the space for action is described. Approaches towards a stronger inclusion of solar energy utilization into area development planning and construction design are described as well.

## 1405 Solar Energy Conversion

*REFER ALSO TO CITATION(S) 2067, 2071, 2072, 2073, 2074, 2075, 2079, 2080, 2083, 2084, 2090, 2092, 2093, 3004, 3009, 3010, 3011, 3012*

2104 (AD-A—130716/4) **Chemically derivatized semiconductor photoelectrodes. Interim technical report.** Wrighton, M.S. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry). 1 Jun 1983. 22p. (TR—37-ONR). NTIS, PC A02/MF A01.

Semiconductor-based photoelectrochemical cells are the best man-contrived devices for the direct conversion of sunlight to electrical or chemical energy using chemically-based systems. Deliberate modification of the surface of the semiconductor photoelectrode is useful in improving the rate of desired processes and in suppressing undesirable anodic corrosion associated with photoanodes. Illustrations of the use of surface modification will be presented with specific examples coming from work with molecular-based derivatizing reagents and from the use of metals or metal oxides coated onto the photoelectrode surface.

2105 (AD-A—131301/4) **Photoluminescent properties of n-GaAs electrodes: applications of the dead-layer model to photoelectrochemical cells. Technical report.** Hobson, W.S.; Ellis, A.B. (Wisconsin Univ., Madison (USA). Dept. of Chemistry). 26 Jul 1983. 20p. NTIS, PC A02/MF A01.

Single-crystal samples of n-type GaAs have been used as electrodes in photoelectrochemical cells (PECs) employing aqueous ditelluride electrolyte. Photoluminescence (PL) from the electrodes can be quenched by the electric field present in the semiconductor during PEC operation. The extent of PL quenching, studied as a function of carrier concentration, excitation wavelength, and applied potential, is consistent with the dead-layer model previously used to describe PL quenching in semiconductor/metal, Schottky-barrier systems. PL quenching curves calculated by assuming that the dead-layer thickness varies with applied potential in the same manner as the depletion width differ from the experimental data, particularly in the region near the flat-band potential. Sources of these discrepancies are discussed, including the possibility that relative PL intensity reflects the manner in which applied potential is partitioned across the semiconductor-electrolyte interface.

2106 (CRN-CPR—83-02) **Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications.** Muller, J.C. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires; Strasbourg-1 Univ., 67 (France)). 16 Dec 1982. 386p. (In French). NTIS (US Sales Only), MF A01. Order Number DE84750177.

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This study aims at demonstrating that a new ion implantation method associated with a pulsed laser annealing can replace conventional surface doping procedure of semiconductors. In the proposed technique (called "Ion Incrustation") the doping is performed by bombarding with non mass analyzed ions. The recrystallization of the amorphized silicon layers by these polyatomic ions has been achieved by using a conventional bulk treatment and a surface annealing technique using high power Q switched lasers. The results from the analysis of the advantages (high quality of regrowth) and disadvantages (electrically active residual defects) of this quick annealing procedure have been used to establish the optimal conditions of manufacturing solar cell junctions.

2107 (DOE/ET/20585—T1) **Tree species and management strategies for biomass production in the Lake States. Fuels from woody biomass. Annual report, March 1, 1980-February 28, 1981.** (Michigan State Univ., East Lansing (USA). Dept. of Forestry). 1981. Contract FG01-78ET20585. 14p. NTIS, PC A02/MF A01. Order Number DE84001610.

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Progress has been made towards each of the 7 major project objectives during 1980-81. Techniques for establishment and management of plantations on old field sites were developed and plans for work on cutover sites have been made. Cultural and genetic improvement in potential biomass species continued to receive major emphasis, and improved seed for several important species was collected. Comprehensive recommendations of species for a range of sites in the Lake States is still the major objective of this project. Preliminary site x species interactions were noted after survival data were taken. More measurements are taken this year. Two economics graduate students are also involved with different aspects of the project. Considerable cooperative efforts exist between the project and both private and public forest land owners. An intensive study of the performance of hybrid poplar over a range of sites in Michigan was completed with several cooperating agencies. A large poplar cutting bed nursery has been established to provide materials for the cutover site plantation work with these hybrids.

2108 (DOE/JPL/956205—83/5) **Development of metallization process: FSA Project, cell, and module-formation research area. Quarterly technical progress report No. 6329-15 for the period ending June 30, 1983.** Garcia, A. III. (Spectrolab, Inc., Sylmar, CA (USA)). Aug 1983. Contract NAS-7-100-956205. 20p. NTIS, PC A02/MF A01. Order Number DE84000253.

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A non-lead frit paste was received from Thick Film Systems Inc. and evaluated. The results were not promising. Additional work was done on a two-step process where the bulk of the metallization is Mo/Sn but a small ohmic pad is silver. This approach was successful. A new matrix of paste formulations was developed with JPL and Electrink, Inc. personnel. A series of 12 pastes was ordered from Electrink, Inc.

2109 (EUR—8160-EN) **Integrated thin film solar cell generators with higher output voltages.** Bloss, W.H.; Hewig, H. (Commission of the European Communities, Luxembourg. Directorate-General for Information, Market and Innovation). 1982. 57p. Available from Commission of the European Communities, Luxembourg.

A technology for the production of large-area integrated Cusub(x)S-CdS thin film solar cell generators with higher output voltages has been developed. On glass substrates with an area of 14.5 x 29 $cm^2$ integrating Ag-back contacts are vacuum-deposited. The CdS-layers are produced by evaporating CdS-powder with the aid of a large-area evaporator (surface area 15 x 30 $cm^2$). They are comparable in quality with those CdS-layers that are vacuum-deposited with a point-type evaporator. For the production of the Cusub(x)-S-layers two modifications of the Clevite wet process have been found to give good results: 1. Dipping the cells in a flow of $Cu^+$-ion solution and 29 spraying the $Cu^+$-ion solution to rotating CdS substrates. A glass sheet, 14.5 x 29 $cm^2$ in size, with an integrating Au-plated copper grid, serves for front-contacting and encapsulation. The resulting generators show efficiencies of up to 4% with respect to the total area of the generators. Long-time sta-

bility tests have revealed that the slight degradation of the generators is due to the failure of single cells.

**2110 (EUR—8205-EN) Ion implantation of glow discharge amorphous silicon and possible application to solar cell devices.** Spear, W.E.; Kablitzer, S. (Commission of the European Communities, Luxembourg. Directorate-General for Information, Market and Innovation). 1982. 68p. Commission of the European Communities, Luxembourg.

The main objectives of the work carried out under the contract were (a) to investigate in some detail the doping of a-Si by ion implantation, (b) to optimise the technique, (c) to study and improve material properties using nuclear and other techniques of measurement and (d) to assess the application of ion implantation to a-Si photovoltaic junction cells. The aims under (a), (b) and (c) were fully realised during the contract period and this work has been published in six papers. It was shown in a systematic study of implantation with trivalent, pentavalent and alkali ions, that a-Si can be doped substitutionally as well as interstitially, and that its electrical properties can be controlled over a remarkably wide range. Compensation by implantation is possible and can be used in junction devices. Implantation damage and its effects on the properties of a-Si have been investigated by photoconductivity and other methods. A nuclear resonance reaction was used to determine the hydrogen profile through the a-Si film and it was concluded that this could be a useful method for investigating the barrier profile in a-Si devices. A series of preliminary experiments on a-Si solar cells with implanted top $p^+$- regions was carried out during the third contract year. Results using an implantation depth of 1000A were encouraging, but showed that for an improved Vsub(oc) appreciably smaller depths are essential. Finally, the main conclusions of the work are summarised.

**2111 (FFI-TN-VM—325) Charcoal as an alternative energy carrier. Pt.1: Resources.** Andersen, S.; Rustad, S. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Dec 1978. 28p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751471.

This report discusses the potential resources of bioenergy in the Norwegian forests. It concludes that between 6.8 TWh and 8.5 TWh is a possible annual gross output without disturbing the traditional forest industry. In order to use waste wood in charcoal production it has to be chipped and transported to a suitable plant for the pyrolyzing. The total cost of waste wood including chipping, transportation and handling is estimated to be Nkr 255-370 in local production in the forests and Nkr 310-420 in centralized production per dry ton of wood. 5 drawings, 10 tables.

**2112 (KTM/E-B—22) Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 109p. (In Finnish). NTIS (US Sales Only), PC A06/MF A01; . Order Number DE83751447.

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The report contains a study of the competitiveness of indigeous solid fuels in district heating and local heating plants compared to imported fuels in Finland. Three types of plants have been considered: individual house heating boilers, 20 kW-1000 kW, district heating boiler plants, 2 MW-30 MW, district heating power plants, 15/30 MW, 30/60 MW, 60/120 MW. The following domestic fuels have been studied in individual house heating boilers: sod peat, peat briquettes, wood, wood chips and straw, and in district heating boilers, sod peat, milled peat and wood chips. Besides milled peat in all district heating power plants also sod peat and wood chips have been taken into consideration in the smallest unit, 15/30 MW. All costs are given in the price level fourth quarter of 1982. Peat is a competitive fuel in all boiler sizes, except in small district heating plants . Sod peat is, however, the most favourable fuel in individual house heating boilers. Also peat briquettes are competitive compared to light fuel oil and anthracite in furnaces of 20 kW-1000 kW. Milled peat is for the moment economically a favourable fuel in district heating boiler plants over 10 MW and district heating power plants. The use of wood chips is economically justified, with today's fuel prices, only in individual house heating boilers. Straw is competitive in small house heating boilers 20 kW-100 kW, while purchased wood is cheaper only compared to light fuel oil in boilers between 50 kW-200 kW. The study has been carried out on a general level and it has not been able to consider special features in ndividual plants. The results should therefore not be used directly when deciding upon a fuel or an investment.

**2113 (KTM/E-B—23) Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 69p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751448.

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The report deals with the competitiveness of indigenous solid fuels compared to imported fuels in industrial furnaces. All cases studied concern new buildings. Two groups of plants have been studied; industrial steam boilers 10 t/h, 20 t/h, 45 t/h , back pressure power plants 10/37 MW, 20/74 MW, 40/148 MW. The competitiveness of milled peat has been studied in all plants. The costs of producing energy in industrial steam boilers and the smallest back pressure power plant have been studied also for sod peat, wood chips and bark. All costs are from the end of 1982. Fuel peat is in most industrial furnaces a competitive fuel compared to imported fuels. It is cheaper to use heavy fuel oil than sod or milled peat only in the smallest steam boiler 10 t/h . Milled peat is, in the studied industrial furnaces, more favourable than coal in the inland. In other areas where peat is delivered both fuels, milled peat and coal, are relatively equivalent when comparing energy production costs. The use of bark as a fuel in the industry is economically justified. The cost of producing energy with bark in steam boilers range between 6.5-9.9 p/kWh, while the cost for oil respectively, alters between 13.1-14.3 p/kWh and for coal 11.5-15.0 p/kWh. Wood chips are, however, not competitive with today's fuel prices. The energy production cost for wood chips is about 13.9-17.5 p/kWh. The study has been carried out on a general level and it has not been able to consider special features in individual plants. The results should therefore not be used directly when deciding upon a fuel or an investment.

**2114 (KTM/E-D—24) Amount of biogas and its availability for use in Finland.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 86p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751444.

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Possibilities of anaerobic treatment of various wastes and the amount of biogas and availabilities for use have been studied The whole biogas potential corresponds to 370 000 tons of oil per annum. The biggest potential for biogas production is in farming. This gas amount is equivalent to about 75% of the total biogas potential in Finland, The theoretical biogas amount derived from municipal wastes is 11% and that derived from industrial effluents about 14% of the total biogas potential. Biogas production as energy source is economical only in farming, and in this context only in bigger pig farms. More investigation is needed to find an economical solution for biogas production in farming, and also theoretical investigation of the behaviour of methane bacteria in different waste waters. Two digester types are developed in Finland for farming waste but their investment costs are so high at the present that only 5% of the whole biogas potential can be economically exploited. In minicipal waste water plants, it is profitable at present to build an anaerobic sludge digester for 10 000-15 000 inhabitants. Anaerobic treatment is one alternative to treat industrial effluents. The applicability of the anaerobic technique depends on the effluent quality and concentration. With the present techniques, the anaerobic treatment of sugar mill effluents is more feasible than other treatment alternatives, considering emvironmental and economical aspects. Also in continuous potato processing industry, one anaerobic treatment process is adapted in Finland. Effluents for breweries, dairies, meats and alcohol plants can easily be treated anaerobically. In pulp and paper industry, suitable effluents for anaerobic treatment are especially those from mechanical pulp and paper mills and fiber board mills. On the contrary, pulp mill effluents contain toxic substances, such as sulphur and chlorine, and anaerobic treatment of these effluents has not yet been sufficiently studied.

2115 **(LA-UR—83-2761) Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides.** Jones, W.M.; Bowman, M.G. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-8309180—1). NTIS, PC A02/MF A01. Order Number DE84001313.

From 6. technical workshop on thermochemical processes; Ispra, Italy (26 Sep 1983).

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Cycles using solid oxide decomposition as the high temperature step may have advantages for coupling with a solar furnace. The CuO-$Cu_2O$ cycle consists of the following steps: 2 CuO = $Cu_2O$ + 1/2 $O_2$ (1300°K); $I_2$ + $Cu_2O$ + $Mg(OH)_2$ = 2 CuO + Mg $I_2$ + $H_2O$ (448°K); $MgI_2$ + $H_2O$ = MgO + 2 HI(g); 2 HI = $H_2$ + $I_2$; and MgO + $H_2O$ = $Mg(OH)_2$. The stages in the second reaction are discussed. The oxidation of CuI to CuO is slow unless excess $Mg(OH)_2$ is present. (DLC)

2116 **(N—8325026) Coherent conversion of the sunlight spectrum. Final Report, 28 July 1980-30 April 1982.** Gustafson, T.K. (California Univ., Berkeley (USA)). 1982. 147p. (NASA-CR—170185). NTIS, PC A07/MF A01.

Efforts related to the utilization of tunneling junctions for the conversion of radiative power to electrical power are reported. The theoretical foundations for these particular devices is presented along with a discussion of many of the practical problems associated with the implementation of such devices.

2117 **(N—8325028) Part 1: Silicon ingot casting. Heat Exchanger Method (HEM).** (Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 111p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 111 p (SEE N83-25027 14-44).

Directional solidification by the Heat Exchanger Method (HEM) is a viable approach for directional solidification of silicon ingots used for terrestrial solar cell applications. Some of the significant advances made during this phase of the program were: ingot size, 34 cm x 34 cm x 17 cm - 45 kg, usable material yield - 90%, solar cell efficiency averaged over the whole ingot - 85% of control CZ (35 kg ingot), very uniform resistivity over the boule, and cycle time for 36 kg ingots - 56 hours. Some of the problems encountered were growth rate decrease with increased ingot height, silicon carbide precipitates, and high dislocation density in HEM material. The silicon carbide is attributed to backstreaming of oil vapors from the vacuum pump the high dislocation density is associated with the thermal history of the boule.

2118 **(N—8325029) Part 2: Multi-wire slicing. Fixed Abrasive Slicing Technique (FAST).** (Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 67p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 67 p (SEE N83-25027 14-44).

The Fixed Abrasive Slicing Techniques (FAST) is a new slicing technique that was developed to slice ingots more effectively. It was demonstrated that 25 wafers/cm can be sliced from 10cm diameter and 19 wafers/cm from 15 cm diameter ingots. Over 99% yield (222 out of a possible 224) was demonstrated during slicing of 10 cm diameter ingots at 25 wafers/cm. The average thickness of wafers was 0.249 mm and the kerf was 0.151 mm. Slicing rates as high as 0.14 mm/min were also demonstrated for 10 cm diameter ingots.

2119 **(N—8325030) Silicon slicing by fixed abrasive slicing technique.** Schmid, F.; Khattak, C.P. (Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 3p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 3 p (SEE N83-25027 14-44).

One of the major cost factors in silicon ingot technology adaptation for terrestrial photovoltaic application is in slicing boules into wafers. The most developed industrial practice is the Internal Diameter (ID) slicing. This method utilizes diamond cutting. The diamond stands up for long periods, hence, the cost of expendable materials is low. However, the ID technology as practiced today has poor material utilization. The Multiblade Slurry (MBS) method has low equipment and labor costs but its expendable material costs are high. Recently Multiwire Slurry (MWS) technology has shown very good material utilization, but its expendable material costs are even higher than MBS. The multiwire Fixed Abrasive Slicing Technique (FAST) still in advanced development stage, combines the low expendable material costs of ID method, the low labor and equipment costs of MBS and high material utilization of MWS.

2120 **(N—8325031) Silicon crystal growth in vacuum.** Khattak, C.P.; Schmid, F. (Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 4p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 4 p (SEE N83-25027 14-44).

The most developed process for silicon crystal growth is the Czochralski (CZ) method which was in production for over two decades. In an effort to reduce cost of single crystal silicon for photovoltaic applications, a directional solidification technique, Heat Exchanger Method (HEM), was adapted. Materials used in HEM and CZ furnaces are quite similar (heaters, crucibles, insulation, etc.). To eliminate the cost of high purity argon, it was intended to use vacuum operation in HEM. Two of the major problems encountered in vacuum processing of silicon are crucible decomposition and silicon carbide formation in the melt.

2121 **(N—8325032) Origin of SiC impurities in silicon crystals grown from the melt in vacuums.** Schmid, F.; Khattak, C.P.; Digges, T.G., Jr.; Kaufman, L. (Jet Propulsion Lab., Pasadena, CA (USA); Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 5p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 5 p (SEE N83-25027 14-44) Repr. from J. of the Electrochem. Soc., V. 126, No. 6, Jun 1979 p 935-938.

A main source of high carbon levels in silicon crystals grown from melt under reduced pressures and contained in silica crucibles supported by graphite retainer/susceptor was identified by thermodynamic analysis. The calculations were verified by experimental results and the carbon level is reduced by approximately 50% with the use of molybdenum retainers.

2122 **(N—8325033) Single crystal growth of upgraded metallurgical silicon by HEM for photovoltaic applications.** Khattak, C.P.; Schmid, F.; Hunt, L.P. (Crystal Systems, Inc., Salem, MA (USA)). Dec 1982. 12p. NTIS, PC A12/MF A01.

In Silicon Ingot Casting, Phase 3 and Phase 4 12 p (SEE N83-25027 14-44).

Commercially available metallurgical grade (MG) silicon has high B and P content which is not reduced significantly by directional solidification. By choosing high purity raw materials for an experimental Submerged Electrode Arc Furnace, most of the impurities are reduced to 10 ppmw. Directional solidification of upgraded metallurgical grade (UMG) silicon by the Heat Exchanger Method (HEM) has produced 16 cm x 16 cm cross section ingots with nearly single crystal structure. The main problem encountered during directional solidification was SiC impurities dispersed through the structure. Solar cells fabricated from UMG silicon that was directionally solidified twice by HEM have shown up to 12.33% (am1) conversion efficiency.

2123 **(N—8325034) Proceedings of the Flat-Plate Solar Array Workshop on the Science of Silicon Material Preparation.** (Jet Propulsion Lab., Pasadena, CA (USA)). Feb 1983. 316p. (NASA-CR—170318; DOE/JPL—1012/81). NTIS, PC A14/MF A01.

Workshop presented at Phoenix, Ariz., 23-25 Aug. 1982.

Several areas of silicon material preparation were addressed including silicon production and purity, thermodynamics, kinetics, mechanisms, particle formation and growth, deposition in fluidized bed reactors, and chemical vapor deposition. Twenty-two papers were presented.

2124 **(N—8325035) Materials for high-temperature thermoelectric conversion.** Feigelson, R.S.; Elwell, D. (Stanford Univ., CA (USA)). Apr 1983. 25p. (NASA-CR—170316). NTIS, PC A02/MF A01.

High boron materials of high efficiency for thermoelectric power generation and capable of prolonged operation at temperatures over 1200 C are discussed. Background theoretical studies indicated that the low carrier mobility of materials with beta boron and related structures is probably associated with the high density of traps. Experimental work was mainly concerned with silicon borides in view of promising data from European laboratories. A systematic study using structure determination and lattice constant measurements failed to confirm the existence of an SiB/sub n/ phase. Only $SiB_6$ and a solid solution of silicon in beta boron with a maximum solid solubility of 5.5-6 at % at 1650 C were found.

2125 **(SAND—83-7020) Linear Fresnel lens photovoltaic concentrator program.** Kull, J.; Maraschin, R.; Rafinejad, D.; Spencer, R.; Sutton, G. (Acurex Corp., Mountain View, CA (USA)). Aug 1983. Contract AC04-76DP00789. 227p. NTIS, PC A11/MF A01. Order Number DE84002971.

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This report describes Acurex Corporation's design of a linear Fresnel lens Photovoltaic Concentrator Panel. The panel consists of four concentrator modules in an integrated structure. Each module is 10 ft long and has a 39.85 in aperture. The solar cell's active width is 0.90 in. and the cell-lens edge spacing is 23.39 in. There are 58 cells per module. A prototype panel was built and tested. Test results showed a peak electrical efficiency of 10.5% at the operating conditions of 800 $W/m^2$ insolation and 90°F coolant temperature. The prototype exhibits the manufacturing and assembly concepts developed.

2126 **(SERI/PR—02085-1-T2) Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, July 15, 1982-October 14, 1982.** Gallagher, A.; Scott, J. (Solar Energy Research Inst., Golden, CO (USA)). 1982. Contract AC02-77CH00178. 6p. NTIS, PC A02/MF A01. Order Number DE83013857.

A high resolution, magnetically confined electron gun ionizer has been constructed for use in conjunction with a mass spectrometer in order to detect neutral radicals produced in the a-Si:H deposition discharge. Measurements have been completed of electron collisional ionization of silane while the new ionizer and mass spectrometer system were evaluated to obtain cross sections in the threshold region for the dissociative ionization processes. (LEW)

2127 **(SERI/PR—02085-1-T3) Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, October 15, 1982-January 14, 1983.** Gallagher, A.; Scott, J. (Solar Energy Research Inst., Golden, CO (USA)). 1983. Contract AC02-77CH00178. 9p. NTIS, PC A02/MF A01. Order Number DE83013858.

After a discussion of the need for measurement of radicals in a silane discharge used in silicon deposition, the unambiguous measurement of SiH/sub n/ radicals from discharges in $Ar+SiH_4$ using a mass spectrometer with a high resolution ionizer is reported. The expected radical signal magnitudes are simply analyzed. (LEW)

2128 **(SERI/TR—8058-2-T5) Advanced photovoltaic concentrator cells. Final report, August 29, 1979-March 31, 1982.** Yang, H.T.; Simpson, W.I.; Yang, J.J.J.; Zehr, S.W. (Rockwell International Corp., Thousand Oaks, CA (USA). Microelectronics Research and Development Center). Jan 1983. Contract AC02-77CH00178. 126p. NTIS, PC A07/MF A01. Order Number DE84002097.

The objective of this project is to demonstrate the technical feasibility of producing monolithic stacked multibandgap solar cells having 30% conversion efficiency at 30°C and 25% conversion efficiency at 150°C under 500 to 1000 SUNs AM2 illumination. The following tasks were undertaken: (1) growth and optimization of single junction AlGaAs cells having bandgaps of 1.6 eV and 1.7 eV and AlGaSb cells having bandgaps of 0.95 eV and 1.1 eV; (2) development of techniques for joining these optimized single junction cells; (3) characterization of performance of the individual subcells and their stacked combinations with regard to light and dark I-V and spectral response behavior over the operating temperature range of 30 to 200°C and for illumination levels of 1 to 1000 SUNs AM2. All of the individual subcomponents and processes which together make up the final device were successfully demonstrated in the course of the program. Working prototype two-junction cells were fabricated and tested. The major specific accomplishments of this program are: (1) successful demonstration of an optically transparent intercell ohmic contact having optical, electrical and mechanical characteristics suitable for use in a concentrator (≧ 500 SUNs) multijunction solar cell; (2) successful development of a new laser process for bonding dissimilar semiconductors; (3) successful demonstration of an $Al_{0.2}Ga_{0.8}As$ homojunction solar cell suitable for use as the low bandgap subcell in a two-junction stacked converter; (4) demonstration of a working monolithic two-junction stacked solar cell employing dissimilar, nonlattice matched III-V semiconductor systems (AlGaAs and AlGaSb).

2129 **(SERI/TR—9002-2-T1) GaAs peeled-film solar cells. Final report, March 15, 1980-December 31, 1981.** Miller, D.L.; Burke, W.E.; Simpson, W.I.; Yang, J.J.J.; Zehr, S.W.; Harris, J.S. (Rockwell International Corp., Thousand Oaks, CA (USA). Microelectronics Research and Development Center). 1982. Contract AC02-77CH00178. 49p. NTIS, PC A03/MF A01. Order Number DE84002101.

Our approach to the fabrication of a peeled film GaAs solar cell is to grow an (AlGa)As layer between the substrate and solar cell. This (AlGa)As parting layer can be etched away selectively to separate substrate and cell. The use of an (AlGa)As parting layer has the advantage of an excellent lattice match to GaAs, which promotes the subsequent growth of a high quality single crystal solar cell. The (AlGa)As material can also be grown in the same reactor used to grow the solar cells. The technical areas most critical to the success of this project are the etch parting process, and subsequent peeled film handling and processing. Highly selective etching of the (AlGa)As is necessary for successful peeling; to peel a 1 cm diameter cell while removing less than 100 A of it requires that the etchant attack the (AlGa)As parting layer at a rate $5 \times 10^5$ times as fast as it attacks GaAs. The peeled film so removed will be extremely fragile, unless support is provided during the parting process.

2130 **(VTT-TUTK—148) Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber.** Siimes, H.; Kuusela, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Jan 1983. 92p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The sifnificance of grading before drying on the drying capacity and quality of sawn timber, and the influence of various factors on the energy consumption of drying, were studied. The investigation was divided into three phases: pre-grading methods (field tests), test drying with laboratory equipment, and application of the results to the process. The green pine sawn timber contains groups that behave differently during drying, and can be separated through log sorting, export grading of sawn timber, or grading based on the weight by volume of pieces of sawn timber. The three best export qualities contained most drying defects. The effect of drying program on the drying costs is considerable. In various tunnel kiln programs, the value of 1 - 3-quality 75 mm thick pine sawn timber dropped by 13 - 26 % during drying. With a low temperature drying program the energy costs were 17% higher than with a high temperature drying program. By using the most suitable drying program in drying of pre-graded sawn timber, we could save a little compared with drying all the qualities with the drying program most suitable for the best qualities. With the present drying capacity the tecl lacks in the dry kiln often prevent the use of the drying programs presupposed by the best qualities. Only one part of the drying capacity could perhaps be repaired suitable for drying of the best qualities and separate them from the production by pregrading. The significance of pre-grading depends on the case and the available drying technique. In situations where we can avoid acquisition of more drying capacity by pre-grading or repair only a part of the existing drying capacity, we can with pre-grading save considerable in drying costs. Pre-grading gives also other economic advantages. It should be considered particularly in investment plans.

2131 **Chemically induced interface states in photoelectrochemical cells.** Butler, M.A.; Ginley, D.S. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* 42: No. 7, 582-584(1 Apr 1983). Contract AC04-76DP00789.

A significant improvement is reported of p-GaP photocathodes for hydrogen evolution by treatment with ruthenium ions. Sub-band-gap spectroscopy has revealed that contrary to expectations the ruthenium treatment introduces new states in the gap 1.23 eV above the valence-band edge and close to a band edge. A new model based upon kinetic considerations is proposed to explain these effects.

2132 **Kinetic studies of enzymatic hydrolysis of insoluble cellulose: (II) analysis of extended hydrolysis times.** Lee, Y.H.; Fan, L.T. (Department of Chemical Engineering, Kansas State University, Manhattan, Kansas 66506). *Biotechnology and Bioengineering;* XXV: No. 4, 939-965(Apr 1983). Contract FG02-79ET00080.

The kinetics of enzymatic hydrolysis of pure insoluble cellulose by means of unpurified culture filtrate of Trichoderma reesei was studied, emphasizing the kinetic characteristics associated wit the extended hydrolysis times. The changes in the hydrolysis rate and extent of soluble protein ad sorption during the progress of reaction, either apparent or intrinsic, were investigated. The hydrolysis rate declined drastically during the initial hours of hydrolysis. The factors causing the reduction in the hydrolysis rate were examined; these include the transformation of cellulose into a less digestible form and product inhibition. The structural transformation can be partially explained by changes in the crystallinity index and surface area. The product inhibition was caused by the deactivation of the adsorbed soluble protein by the products, which essentially represents the so-called "un-competitive" inhibition. The kinetics of B-glucosidase were also studied. The result has shown that the action of B-glucosidase is competitively inhibited by glucose. It has been found that the integrated form of the initial rate expression cannot be used in predicting the pro gress of reaction because the digestibility of cellulose changes drastically as the hydrolysis pro ceeds, and that the rate expression for enzymatic hydrolysis of cellulose cannot be simplified or approximated by resorting to the pseudo-steady-state assumption. A mechanistic kinetic model of cellulose hydrolysis should include the following major influencing factors: 1) mode of action of enzyme, 2) structure of cellulose, and 3) mode of interaction between the enzyme and cellulose molecules.

2133 **Methanol bioconversion by Butyribacterium methylotrophicum--batch fermentation yield and kinetics.** Datta, R.; Ogeltree, J. (Exxon Research and Engineering Company, Linden, New Jersey 07036). *Biotechnology and Bioengineering;* XXV: No. 4, 991-998(Apr 1983).

Butyribacterium methylotrophicum is an anaerobic bacterium that can convert methanol to butyrate. This ability to produce longer-chain carbon compounds from $C_1$ substrates could be of commercial significance. The fermentation rates and product formation depend on the methanol/bicarbonate ratios during fermentation. The kinetics of batch fermentation fit the Luedeking-Piret model with growth and maintenance associated product formation. Butyrate yield of 0.256 mol/mol methanol (ca. 85% of theoretical yield) has been obtained in batch fermentation.

2134 **Lipid-enhanced ethanol production by Kluyveromyces fragilis.** Janssens, J.H.; Burris, N.; Woodward, A.; Bailey, R.B. (Solar Energy Research Inst., Golden, CO). *Applied and Environmental Microbiology;* 45: No. 2, 598-602(Feb 1983).

The fermentation ability of a strain of Kluyveromyces fragilis, already selected for rapid lactose-fermenting capability, was improved dramatically by the addition of unsaturated fatty acids and ergosterol to the medium. The fermentation time of a 20% whey-lactose medium was decreased from over 90 h to less than 60 h. The lipids were shown to be taken up by the organism, and the effects on specific growth rate and biomass production was determined.

2135 **High temperature solar-thermochemical processing-hydrogen and sulfur from hydrogen sulfide.** Noring, J.E.; Fletcher, E.A. (Sandia National Laboratory, Livermore, California). *Energy (Oxford);* 7: No. 8, 651-666(Aug 1982).

Sunlight, concentrated to high intensities, has a rarely recognized potential for adding process heat to reactors at high temperatures. Hydrogen sulfide is a by-product of the sweetening of fossil fuels. In this paper, the authors use, as an example, the production of hydrogen and sulfur from hydrogen sulfide as a device for showing how solar processing might be considered as a successor to a currently used industrial process, the Claus process. They conclude that this and other processes should be explored as means of using as well as storing solar energy.

## 1406 Photovoltaic Power Systems

*REFER ALSO TO CITATION(S) 2525*

2136 **(DOE/CE/15095—5) Photovoltaics in the Pacific Islands: an introduction to PV systems.** (National Center for Appropriate Technology, Butte, MT (USA)). Sep 1983. Contract AC01-82CE15095. 34p. NTIS, PC A03/MF A01 - GPO. Order Number DE84002149.

The basic parts of a photovoltaic system are explained in elementary terms. Some learning activities and references are included. (LEW)

2137 **(EUR—8200-EN) Development of a 1 pKW photovoltaic concentrator system with silicon cells.** Pizzini, S.; Giuffrida, M.; Oberti, A.; Zani, P.; Dionisio, G.; Ramacciotti, G.; Scarpi, G.;Conti, M.; Nason, P. (Commission of the European Communities, Luxembourg. Directorate-General for Information, Market and Innovation). 1982. vp. Commission of the European Communities, Luxembourg.

This 18 months contract began on January 1, 1978 with the objective to design, construct and preliminarily test a 1 pkW photovoltaic unit with concentration (50 X), passive cooling and silicon cells. The results of this program and those of the subsequent systematic testing of the performances of the prototype should serve for the evaluation of the merits of use of small photovoltaic units with concentration in the South of Europe and will permit, eventually, to adapt the characteristics of the photovoltaic generator to the need of a dependable electricity producing system ready to meet load demands at any time. The results, furthermore, will be particularly appropriate in order to appreciate the possible effects of the whether on yearly electrical output of a passively cooled system, to evaluate the cost and structure influence of the passive cooling and for the study of different optical system (Fresnel lenses and Fresnel prisms) as well as for the optimization of silicon solar cells.

2138 **(EUR—8571-FR) Experimentation of micro-irrigation by solar pumping: 1979-1981. Final report.** Preel, X. (Societe Nationale ELF-Aquitaine, 75 - Paris (France)). 1983. 82p. (In French). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

2139 **(N—8325040) Spectrophotovoltaic orbital power generation. Final Report, August 1981-November 1982.** Knowles, G.; Carroll, J. (Honeywell, Inc., Minneapolis, MN (USA). Systems and Research Center). Mar 1983. 82p. (NASA-CR—170754). NTIS, PC A05/MF A01.

A subscale model of a photovoltaic power system employing spectral splitting and 1000:1 concentration was fabricated and tested. The 10-in. aperture model demonstrated 15.5% efficiency with 86% of the energy produced by a GaAs solar cell and 14% of the energy produced by an Si cell. The calculated efficiency of the system using the same solar cells, but having perfect optics, would be approximately 20%. The model design, component measurements, test results, and mathematical model are presented.

## 1407 Solar Thermal Power Systems

*REFER ALSO TO CITATION(S) 2146*

## 1409 Solar Thermal Utilization

*REFER ALSO TO CITATION(S) 2593, 2596, 2598, 2600, 2601, 2616, 2616*

2140 **(CEA-CONF—6659) Solar desalination.** Maurel, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1982. 3p. (CONF-8211128—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84750124.

From 1. conference of the solar energy research center; Bagdad, Iraq (27 Nov 1982).

This paper presents two optimized solar desalination processes: multiple effect distillation combined with solar flat collectors and reverse osmosis with energy recovery.

2141 (CONF-811288—, pp 11-18) **'Passive' utilization of solar energy.** Schreck, H. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Research, development and practical application of solar energy utilization have progressed with very different paces world wide. 12 geographic regions of the earth are evaluated with regard to know-how level of passive solar planning main sectors of research, development and practical application, special interest a information exchange on solar energy. The analysis shows the interest of various professions and trades organisations in passive utilization of solar energy. The survey also evaluates the development state of passive refrigeration; it deals with development and tendencies of various kinds of buildings. The USA have made the greatest progress on all sectors of Solar energy utilization, the FRG occupies one of the last places.

2142 (CONF-811288—, pp 19-29) **Experiences with projects and competitions - demonstration projects for solar energy utilization in residential buildings.** Schaefer, G.F.; Meyer, T. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

The demonstration object Landstuhl was conceived for private builders who get a special public subsidies to built 60 one- and two family houses in a building area specially suited for the utilization of solar energy. The project serves several aims of energy policy, for example achieving a diffusion effect of the solar houses. Energy savings between 30-50% compared to conventional houses are expected. Aspects which influence the decision to built an innovative house are examined and so are measures and conditions which improve the understanding and accepting these houses and energy saving measures. Experiences made with the Landstuhl project are described.

2143 (CONF-811288—, pp 31-44) **Solar architecture of the Log-id team - experiences from the experimental greenhouse in Tuebingen, architects' solutions for residential buildings.** Schempp, D.; Seidel, T.; Krampen, M. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Green solar architecture means that solar energy is utilized by combining a greenhouse with a residential house. The greenhouse also serves as living/working sphere with regard to planning and atmosphere. In 1976 an experimental house was built in Tuebingen. Based on the residents experience with effect and reaction of room climate, climate changes over the year, vegetation etc. the principles of green solar architecture are explained. Building cost and cost savings and problems of getting a building permit are dealt with. Finally acceptance and prospects of this kind of architecture are gone into.

2144 (CONF-811288—, pp 45) **Collecting environmental energy with construction.** Gertis, K. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

So far mainly active solar engineering such as collectors etc. was used. Passive solar engineering received less attraction though it's easier to include in construction. It means climate-adjusted house design, using windows as solar collectors, using the building itself as energy store. The authors refer to quantitative and qualitative description of these measures of construction physics for energy collection and deals with the basic relation between constructive measures and solar/environmental energy utilization.

2145 **(DOE/CE/30741—T1) Assessment of solar technology in the home-building industry. Final report.** (NAHB Research Foundation, Inc., Rockville, MD (USA)). Jun 1983. Contract AC02-82CE30741. 134p. NTIS, PC A07/MF A01. Order Number DE84001150.

The NAHB Research Foundation, Inc., conducted a review of existing survey data supplied by home builders. The objective of this effort was to provide data which would serve as a basis for evaluating the completed and/or continuing programs of the Office of Solar Heat Technologies and to identify areas of future program emphasis.

2146 **(SAND—83-2074) Solar industrial process heat (IPH) project. Technical report, October 1981-September 1982.** Harley, E.L.; Stine, W.B. (Sandia National Labs., Albuquerque, NM (USA); California Polytechnic State Univ., San Luis Obispo (USA)). Oct 1983. Contract AC04-76DP00789. 136p. NTIS, PC A07/MF A01. Order Number DE84002758.

This document contains a report of the work performed in the Solar Industrial Process Heat Project during FY 1982. The work consisted of solar energy experiments at eight industrial sites, performed under separate DOE contracts by seven different prime contractors. The eight experiments were active projects receiving DOE funding during FY 1982 and constituted the remaining portion of a broader program of experiments some of which had been completed in prior years. Construction was essentially complete for the solar energy systems, and the experiments were entering into the operational phase. The report contains a description of each of the experiments and a discussion of system performance and operation and maintenance experience. The project is sponsored by the Systems Test and Evaluations Branch of the Division of Solar Thermal Technology, Department of Energy.

2147 **(VTT-TUTK—186) Performance of three solar houses.** Kalema, T.; Maeaettae, J.; Palm, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 96p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Summary also in English.

The performance of three solar houses is presented. Electricity is the basic energy source and warm air heating the heat distribution system. Solar collector area is 10-18 $m^2$. Measurements were performed during 1979-1981 and lasted in each house one year. The electricity consumption of heating, blowers and pumps, and households was measured. The solar energy from collectors, the heating energy from air heating systems and the indoor temperatures were continuously measured. The efficiency of the exhaust air heat recovery system was measured a few times. The publication treats mainly the properties of solar and warm air heating.

## 1410 Solar Collectors And Concentrators

2148 **(DOE/CS/15072—T5) Line-focusing adjustable parabolic solar-concentrating collector. Final report.** Dame, R.E. (Dame (Richard E.), Silver Spring, MD (USA)). 30 Sep 1983. Contract FG01-81CS15072. 33p. NTIS, PC A03/MF A01. Order Number DE84001590.

Portions are illegible in microfiche products. Original copy available until stock is exhausted.

An Adjustable Focus Concentrating (AFC) line focus collector is described and analyzed. This device is a concentrating collector scheme which permits development of a very accurate line focus parabolic concentrating collector system by means of actively tuning a flat sheet of reflective material. The shape created by flexing this thin sheet can approximate a parabolic collector system very well. Since this is possible, the device has the potential to reduce the fabrication and assembly costs for line focus concentrating solar collectors. The purpose for the present project was to commercialize this concept. The project, therefore, was directed at evaluation of the design for potential commercialization and for fabrication.

2149 **(SERI/TP—255-2091) Polymeric glazings.** Schissel, P. (Solar Energy Research Inst., Golden, CO (USA)). Oct 1983. Contract AC02-83CH10093. 8p. (CONF-830990—2). NTIS, PC A02/MF A01. Order Number DE84000016.

From Solar thermal research workshop; Atlanta, GA, USA (7 Sep 1983).

The study presented was undertaken to evaluate polymer-coated silver mirrors with reflectances greater than 90% that can approach a lifespan of five years. Evaluation of silver mirrors has been initiated and is continuing, using realtime outdoor screening tests along with accelerated weathering devices. Mechanistic studies of degradation processes are also in progress. The experimental approach is multifaceted. Metallized films currently available from industrial sources are tested, commercially available polymeric films are silvered and tested, and polymeric films are formed onto silver films, which are deposited on a glass substrate for testing. A series of experiments demonstrates that the dimunition of reflectance using wet-processed silver is not a chemical effect. PMMA is found to be stable in sunlight. (LEW)

2150 **(SERI/TR—253-1906) Determination of freeze-protection heat loss from a parabolic trough solar system.** May, E.K. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1983. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01. Order Number DE84000005.

A small-scale experiment was undertaken to determine practical control temperatures for a parabolic trough, pulsed-flow water freeze-protection scheme. Measurements were also taken of heat loss from stagnant water in the absorber tube under freezing ambient conditions. Using the experimental data and data available from the literature, manipulation of long-term weather data provided estimates of annual thermal losses to prevent freezing. In a cold climate such as Denver, Colorado's, which typically has 155 freezing days per year, such losses should be less than 0.7% of the annual energy delivered by an efficient parabolic trough system.

### 1420 Heat Storage

2151 **(N—8325076) Assessment of energy storage for solar applications.** Edwards, D.J.; Rosenzweig, S. (Aerospace Corp., Germantown, MD (USA)). Feb 1982. 8p. (CONF-810940—). NTIS, PC A17/MF A01.

From Annual contractors' review meeting on thermal and chemical storage; Tysons Corner, VA, USA (16 Sep 1981).

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 194-200 (SEE N83-25057 14-44).

The first three phases of the Solar Applications Analysis for Energy Storage study performed for the Office of Advanced Conservation Technologies of the Department of Energy is presented. Phase 1 surveyed solar energy applications, phase 2 developed a uniform methodology for assessments, and phase 3 summarized prior applicable storage assessments. Three referenced reports thoroughly cover each of the phases and are available from the authors.

2152 **(N—8325083) Molten salt thermal energy storage subsystem for solar thermal central receiver plants.** Wells, P.B.; Nassopoulos, G.P. (Martin Marietta Aerospace, Denver, CO (USA)). Feb 1982. 7p. (CONF-810940—). NTIS, PC A17/MF A01.

From Annual contractors' review meeting on thermal and chemical storage; Tysons Corner, VA, USA (16 Sep 1981).

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 279-285 (SEE N83-25057 14-44).

The development of a low cost thermal energy storage subsystem for large solar plants is described. Molten nitrate salt is used as both the solar plant working fluid and the storage medium. The storage system consists of a specially designed hot tank to hold salt at a storage temperature of 839K (1050 deg F) and a separate carbon steel cold tank to hold the salt after its thermal energy has been extracted to generate steam. The hot tank is lined with insulating firebrick to reduce the shell temperature to 561K (550 deg F) so that a low cost carbon steel shell is used. The internal insulation is protected from the hot salt by a unique metal liner with orthogonal corrugations to allow for numerous cycles of thermal expansion and contraction. A preliminary design for a large commercial size plant (1200 MWh sub +), a laboratory test program for the critical components, and the design, construction, and test of a small scale (7 MWH sub t) research experiment at the Central Receiver Test Facility in Albuquerque, New Mexico is described.

2153 **Breakeven costs of storage in optimized solar energy systems.** Leigh, R.W. (Department of Energy and Environment, Brookhaven National Laboratory, Associated Universities, Inc., Upton, NY 11973). *Energy (Oxford);* 7: No. 8, 689-703(Aug 1982). Contract AC02-76CH00016.

This paper describes the results of an analysis of the breakeven cost, or value, of energy storage to solar energy systems. The value of storage depends strongly both on the solar fraction of the solar energy system in which the storage is employed and on the cost of the collectors used in the system. Various strategies for dealing with this ambiguity are presented. For a broad class of technically and economically practical solar energy systems, storage costs need only be low enough to make a system employing very small amounts of storage practical. Reductions in the cost of collectors will thereafter produce greater reductions in the total system costs or provide greater fuel displacement at constant total system cost than will reductions in the cost of storage, within the limits discussed in the body of the paper. The analysis makes use of a simple, accurate representation of solar energy system performance which may prove useful in other contexts.

## 15 GEOTHERMAL ENERGY

2154 **(DOE/CE—0108) Geothermal Progress Monitor report No. 8. Progress report.** (USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC. Div. of Geothermal and Hydropower Technology). Nov 1983. 89p. NTIS, PC A05/MF A01. Order Number DE84002954.

Geothermal Progress Monitor (GPM) Report Number 8 presents information concerning ongoing technology transfer activities and the mechanisms used to support these activities within geothermal R and D programs. A state-by-state review of major geothermal development activities for the reporting period 1 February 1983 through 31 July 1983 is provided. Recent drilling and exploration efforts and the current status of geothermal electric power plant development in the United States are summarized.

### 1501 Resource Status And Assessment

2155 **(AD-A—131460/8) Geothermal potential of Marine Corps Mountain Warfare Training Center at Pickel Meadow, California. Technical memo.** Danti, K.; Whelan, J.A.; Katzenstein, A.M. (Naval Weapons Center, China Lake, CA (USA)). May 1983. 37p. (NWC-TM—4898). NTIS, PC A03/MF A01.

Contents: Climate and Vegetation; Geology of Area; Water Geochemistry; Chemical Geothermometry; Soil Geothermometry; Thermal Gradient Drilling; Thermal Data; Gravity and Aeromagnetics.

2156 **(CONF-8305149—Summ.) Imperial County geothermal development annual meeting: summary.** (Imperial, County of, El Centro, CA (USA). Dept. of Public Works). 1983. Contract FC03-79ET27196. 67p. NTIS, PC A04/MF A01. Order Number DE84000349.

From 7. annual Imperial County Geothermal Development meeting; El Centro, CA, USA (5 May 1983).

All phases of current geothermal development in Imperial County are discussed and future plans for development are reviewed. Topics covered include: Heber status update, Heber binary project, direct geothermal use for high-fructose corn sweetener production, update on county planning activities, Brawley and Salton Sea facility status, status of Imperial County projects, status of South Brawley Prospect 1983, Niland geothermal energy program, recent and pending changes in federal procedures/organizations, plant indicators of geothermal fluid on East Mesa, state lands activities in Imperial County, environmental interests in Imperial County, offshore exploration, strategic metals in geothermal fluids rebuilding of East Mesa Power Plant, direct use geothermal potential for Calipatria industrial Park, the Audubon Society case, status report of the Cerro Prieto geothermal field, East Brawley Prospect, and precision gravity survey at Heber and Cerro Prieto geothermal fields. (MHR)

## 1502 Geology And Hydrology Of Geothermal Systems

2157 **(INS-R—295) Geothermal remnant activity at Ngawha 1981.** Whitehead, N.E. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Sep 1981. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704311.

A list of gas seepages and ground recently subjected to geothermal alteration at Ngawha.

2158 **(INS-R—298) Radioactive tracers in geothermal underground water flow studies.** McCabe, W.J.; Barry, B.J.; Manning, M.R. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Oct 1981. 52p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704319.

Radioactive tracers have been used to study the movement of water in several geothermal fields, including Wairakei and Broadlands, in New Zealand. This technique has been particularly useful in hot water reinjection investigations for detecting the invasion of reinjected water into the production zone. Iodine-131 has been used as the tracer and the methods and equipment used to inject, sample and measure it are described. The single well dilution method of estimating horizontal flow velocities was found to be useful as a preliminary step to multi-well testing. A number of tests in both fields are discussed, and some details of the results presented. Peak velocities as high as 17 m/hr were observed and tracer recoveries of over 10% obtained. Possible interpretation of some of the results in relation to available geological descriptions are made. The dominating influence of faulting on water movement, and the inadvisability of relying on distance alone to prevent cold water reentering into a production field, is stressed.

2159 **(N—8324929) Thermal history of the Georges Bank Basin.** Arthur, M.A. (Geological Survey, Washington, DC (USA)). 1982. 10p. NTIS, PC A09/MF A01.

In Geol. Studies of the COST Nos. G-1 and G-2 wells, US North Atlantic Outer Continental Shelf p 143-152 (SEE N83-24921 14-42).

Aspects of the present-day thermal gradient and the thermal history of the Georges Bank basin are discussed based on data from the COST Nos. G-1 and G-2 wells. Basin subsidence, sedimentation, and continental margin evolution are considered with regard to the indications of thermal maturity in sedimentary organic matter and possible hydrocarbon generation in the basin.

2160 **(PB—83-243139) Stable isotopic investigation of the ground water quality and transport systems in the Safford Valley, Arizona. Report for Oct 80-Sep 81.** Long, A. (Arizona Univ., Tucson (USA). Dept. of Hydrology and Water Resources). Jul 1983. 81p. NTIS, PC A05/MF A01.

Integration of geologic, hydrologic, major-ion chemical, stable-isotope and radioisotope data from Safford indicates that the Safford thermal waters are produced by deep circulation into the basin, which has relatively normal thermal characteristics. These waters are forced to the surface by pressure derived from the high-standing mountain ranges at the basin margins. The absence of shifts in isotopic composition off the meteoric line indicates that the temperatures in the reservoirs are too low to permit boiling (shift to the left) or water-mineral isotope-exchange reactions (shifts to the right of the meteoric line). In the absence of shifts, the isotopic compositions of the thermal waters indicate the isotopic compositions in their source area(s) and imply that the surrounding mountain ranges were the source area. The water-mineral equilibria relationships of waters sampled along hypothesized flow paths also indicate a mountain source for thermal waters and define the flow paths of waters recharged at the mountain fronts to deep aquifers in the basin sediments.

2161 **Heat transfer in fractured geothermal reservoirs with boiling.** Pruess, K. (Lawrence Berkeley Lab., CA). *Water Resources Research;* **19**: No. 1, 201-208(Feb 1983). Contract AC03-76SF00098.

Analytical and numerical techniques are used to study nonisothermal flow of water and steam in idealized fractured porous media. We find that heat conduction in the rock matrix can substantially alter the flowing enthalpy in the fractures. Effects of matrix permeability and fracture spacing are demonstrated for production from and injection into vapor-dominated and liquid-dominated geothermal reservoirs.

## 1503 Geothermal Exploration And Exploration Technology

*REFER ALSO TO CITATION(S) 2149, 2150, 2167, 3433*

2162 **(EUR—8380-EN) Seismic mapping and geological prognosis for the geothermal prospects Farsoe, Nibe and Loegstoer: exploratory well and reservoir investigation Farsoe-1. Parts 1, 2, and 3.** Poulsen, K.D.; Holm, L. (Commission of the European Communities, Luxembourg). [nd]. 271p. NTIS, PC E11/MF E11.

A seismic survey has been carried out in the North of Jutland in order to select the best drill site for a geothermal well. The districts studied are Farso, Nibe and Logstor. The first part of the report presents the results of the surveys with reflecting horizons and the thickness of the various formations that can be of geothermal interest. It was decided to drill an exploratory well in Farso. The second report presents the well summary and contains all the pertinent data, the drilling history with mud and the casing program, and an exploration chapter with lithological information. The third volume presents the testing of Farso 1 well, in particular the Gassum formation.

2163 **(EUR—8719-EN-IT) Community demonstration project: geothermal pair of wells at Latera. Final drilling report.** (Ente Nazionale per l'Energia Elettrica, Pisa (Italy). National Geothermal Unit). 1983. 138p. (In English and Italian). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

The results from this well verified the indications obtained from Latera 1 and 2 wells as regards the temperature regime of Latera caldera and the trend of the buried carbonate structure individuated by various surveys. As far as temperature is concerned this bore confirmed that the drilling area has the highest gradient values of all Latera zone (2.95°C/10 m), as revealed previously by test borehole 161. Below the terrains of Latera volcanic edifice, the borehole crossed a fold of the Tuscan Series terrains and allochthonous flysch facies terrains; the lower part contains thin igneous intrusions, thermometamorphosed and hydrothermalized rocks with secondary mineralizations. This fold is indoubtedly the most interesting element revealed by the bore, from the geothermal standpoint as well as the geological-structural one. The formations underlying the terrains of the Mesozoic carbonate series that are involved in this fold cannot, at least locally, act as a reservoir of geothermal fluids, because of their lack of permeability. The fractures encountered by the bore are at present incapable of providing an industrial scale production of fluids.

2164 **(EUR—8722-EN-IT) Community demonstration project: geothermal wells at Cesano. Final drilling report.** (Ente Nazionale per l'Energia Elettrica, Pisa (Italy). National Geothermal Unit). 1983. 96p. (In English and Italian). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

Cesano 7 well has confirmed that the central-northern part of the Cesano Research Lease is of geothermal interest, individuating a permeable reservoir within the Liassic limestones. The fluid in this reservoir consists of a brine of more than 220°C and small quantities of gas. The chemical characteristics of the fluid will be defined in greater detail during subsequent tests, but the preliminary data suggest a total salinity of about 70,000 ppm, with a prevalence of chlorides and sulphates. During the first few of production there were no obvious signs of incrustation phenomena; flow-rate exceeded 300 $m^3/h$, with a well-head temperature and pressure of 180°C and 25 $kg/cm^2$ respectively. The surface equipment is now being constructed for long-term production tests (plant, separator, tank, etc.), which will provide further details on the reservoir and fluid characteristics.

2165 **(INS-R—301) Stable Isotope Group 1981 progress report.** Stewart, M.K. (ed.). (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Apr 1982. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704312.

Geothermal studies were reported on the Tauhara, Wairakei, Orakeikorako and Mokai areas. We assisted the two N.Z. geothermal consultant companies with isotope analyses and the Geothermal Institute with lectures on stable isotope aspects of the diploma course. Sample collections were made at Ngawha and Wairakei. Oxygen isotope studies of central North Island volcanics have shown a negative correlation of delta $^{18}O$ with $SiO_2$ content of dacites and rhyolites; contamination of subcrustal rhyolite differentiates by greywacke appears the best explanation. A series of four papers on 'Environmental Isotopes in New Zealand Hydrology' was published during the year. Parts 1 and 2 described the principles and measurement techniques and Parts 3 and 4 described isotope studies of the Pupu Springs, Takaka and the groundwater resources of the Waimea Plains respectively. Carbon isotopes have proved useful in elucidating the food sources of freshwater insects in forest streams on the West Coast and brachiopods from Fiordland. Potassium-argon dating studies were completed on volcanics of the Auckland Islands, North Canterbury and East Otago, basement granites and meta-sediments of Marie Byrd Land, West Antarctica and slates in Western Tasmania. Rubidium-strontium computer programs were developed to control the solid-source mass spectrometer, chemical methods for preparation of strontium and rubidium samples were substantially improved and the first analyses of USGS rock standards were completed. Fission-track dating on minerals from granites from Buller and Westland have shown ages of 100-150Ma on the West Coast decreasing to about 5Ma at the Alpine Fault, reflecting recent uplift there.

2166 **(INS-R—302) Ngawha track etch survey 1981. Preliminary results.** Whitehead, N.E. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Mar 1982. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704313.

Grid locations are given of the highest 30 soil radon levels found in the 1981 Ngawha radon survey. Most seem to be on hills.

## 1505 Economic And Financial Aspects

2167 **(NP—3770413) Economic utilization of geothermal energy.** Rose, G. (Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik). 27 May 1982. 139p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770413.

Geothermal energy stored in hot dry rock can theoretically be used to generate power. The Hot-Dry-Rock method with binary system is the suitable method. Here a method is presented for the calculation of the whole process, the results of which allow to determine the thermodynamically most favourable operational data of the process. The economy of the Hot-Dry-Rock method with binary system is investigated. The operational data are evaluated along the lines of process efficiency and efficiency degree of energy conversion. The performance of the binary system is related to the water flow. The efficiency degree is the ratio of and specific exergy of water. Performance and efficiency degree are given as factors of turbine entrance temperature and turbine entrance pressure. In order to judge the economic profitability the interest on the invested capital is calculated. The plant costs are pre-calculated and the annual income and spending are estimated by means of official statistics and data given in the literature.

## 1506 Environmental Aspects And Waste Disposal

*REFER ALSO TO CITATION(S) 3417*

2168 **(DOE/SF/01326—T6) Direct-heat applications of geothermal energy in The Geysers/Clear Lake region. Volume II. Environmental assessment. Final report.** (Ecoview, Napa, CA (USA)). Aug 1977. Contract AC03-77SF01326. 236p. NTIS, PC A11/MF A01. Order Number DE84002617.

The following are covered: general aspects of the study area, the air resource status and quality, the water resource status and quality, the vegetation resource, and the faunal resource.

## 1508 Geothermal Power Plants

*REFER ALSO TO CITATION(S) 2150*

2169 **(EGG-M—14483) Raft River 5MW(e) binary geothermal-electric power plant: operation and performance.** Bliem, C.J. Jr. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 7p. (CONF-831041—18). NTIS, PC A02/MF A01. Order Number DE84002226.

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

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A 5MW(e) Pilot Geothermal Power Plant was built at Raft River, Idaho, as an integral part of the Department of Energy's plan for commercial development of geothermal energy. The purpose of the plant was to investigate the technical feasibility of utilizing a moderate temperature hydrothermal resource (275 to 300°F) to generate electrical power in an environmentally acceptable manner. The plant used a dual-boiling binary cycle with isobutane as the working fluid, and drew thermal energy from a 280°F liquid-dominated resource. This paper presents the results of that testing, comparing the system performance to the performance predicted prior to operation along with a summary of operational experience.

## 1509 Geothermal Engineering

*REFER ALSO TO CITATION(S) 2157, 2158*

2170 **(DOE/ET/27184—T1) Carbonate scaling - literature review and analysis.** Pepper, J.C.; Larkin, B.J. (Science Applications, Inc., La Jolla, CA (USA)). 19 Feb 1979. Contract AC03-78ET27184. 32p. NTIS, PC A03/MF A01. Order Number DE84002606.

A survey of the literature on carbonate scaling is presented as it affects geothermal fluid systems. The geothermal brine, as the fluid is called, contains a number of chemical constituents which have leached into it from the reservoir rock. As the hot fluid is withdrawn through wells, a flow of steam, water, or a mixture of steam and water, results. If the well flows at a high enough rate, some brine will flash to steam because of the pressure drop, resulting in the steam/water flow mixture. The chemical composition of the brines is tabulated as the composition of the components in the water system before flashing and the composition of the non-condensible gases after flashing. Total dissolved solids vary from that of ordinary well water to concentrated solutions as high as 40% by weight. Calcium is a major cationic constituent, and biocarbonate an important anionic constituent of the brine. Prevention/treatment

techniques, specific site experimental results, and computer models are presented.

2171 **(EGG-M—11683) Evaluation of direct-use-project drilling costs.** Dolenc, M.R.; Childs, F.W.; Allman, D.W.; Sanders, R.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 5p. (CONF-831041—19). NTIS, PC A02/MF A01. Order Number DE84002201.

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

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This study evaluates drilling and completion costs from eleven low-to-moderate temperature geothermal projects carried out under the Program Opportunity Notice (PON) and User-Coupled Confirmation Drilling Programs. Several studies have evaluated geothermal drilling costs, particularly with respect to high-temperature-system drilling costs. This study evaluates drilling costs and individual cost elements for low-to-moderate temperature projects. It considers the effect of drilling depth, rock types, remoteness of location, rig size, and unique operating and subsurface conditions on the total drilling cost. This detailed evaluation should provide the investor in direct-use projects with approximate cost projections by which the economics of such projects can be evaluated.

2172 **(EUR—8247-FR) Analysis of the conditions of geothermal drilling and completion.** (Geoservices Hydrologie S.A., Paris (France)). 1983. 314p. (In French). European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037.

2173 **(EUR—8724-EN) Community demonstration project: geothermal well at Southampton. Final drilling report.** (Institute of Geological Sciences, London (UK)). 1983. 65p. European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

The Southampton (Western Esplanade) Well is a geothermal development well drilled for Southampton City Council. If long-term production tests prove an adequate hot water resource, the well will be used to heat a large new development including offices, shops and a leisure centre. As there is still a significant risk involved in exploring for and developing geothermal energy in the United Kingdom, the drilling project and the initial production tests on the well are being under-written by the Department of Energy. Financial support is also provided by the European Communities. Drilling began on 26 September 1981 and the final depth of 1827 m was reached on 20 November, a total of 56 days. After the well had been drilled, parts of the well-face collapsed while tests were being carried out prior to inserting casing. Remedial work that following meant the well was not finally completed and ready for flow tests until 10 December. A preliminary production test was carried out between 11 and 16 December 1981 by gas-lifting with nitrogen. The project is described up to the end of this pumping test.

2174 **(LA-UR—83-3071) Geothermal pumping systems.** Hanold, R.J. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 17p. (CONF-831077—1). NTIS, PC A02/MF A01. Order Number DE84001728.

From Short course on pressure vessel design and fabrication; San Diego, CA, USA (10 Oct 1983).

Improvements in electric submersible pumping systems have resulted in a demonstrated downhole running life of one year for low horsepower units operating in 180°C brine. The implementation of a prototype pressurized lubrication system to prevent brine intrusion and loss of lubricating oil from the motor and protector sections has been successfully tested. Second generation pressurized lubrication systems have been designed and fabricated and will be utilized in downhole production pumping tests during FY 84. Pumping system lifetime is currently limited by available power cable designs that are degraded by high-temperature brine. A prototype metal-sheathed power cable has been designed and fabricated and is currently undergoing destructive and nondestructive laboratory testing. This cable design has the potential for eliminating brine intrusion into the power delivery system through the use of a hermetically sealed cable from the surface to the downhole motor.

2175 **(LA-UR—83-3072) Two-phase flow studies.** Hanold, R.J. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 18p. (CONF-8310177—2). NTIS, PC A02/MF A01. Order Number DE84001727.

From 2. annual DOE geothermal progress review meeting; Washington, DC, USA (11 Oct 1983).

The two-phase flow program is directed at understanding the hydrodynamics of two-phase flows. The two-phase flow regime is characterized by a series of flow patterns that are designated as bubble, slug, churn, and annular flow. Churn flow has received very little scientific attention. This lack of attention cannot be justified because calculations predict that the churn flow pattern will exist over a substantial portion of the two-phase flow zone in producing geothermal wells. The University of Houston is experimentally investigating the dynamics of churn flow and is measuring the holdup over the full range of flow space for which churn flow exists. These experiments are being conducted in an air/water vertical two-phase flow loop. Brown University has constructed and is operating a unique two-phase flow research facility specifically designed to address flow problems of relevance to the geothermal industry. An important feature of the facility is that it is dedicated to two-phase flow of a single substance (including evaporation and condensation) as opposed to the case of a two-component two-phase flow. This facility can be operated with horizontal or vertical test sections of constant diameter or with step changes in diameter to simulate a geothermal well profile.

2176 **(SAND—83-7440) Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report.** Brown, G.L. (BDM Corp., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 39p. NTIS, PC A03/MF A01. Order Number DE84002137.

GEOCOM, a computer code that provides life cycle cost/benefit analysis of completion technologies applied to geothermal wells, is used to study fracture stimulation techniques. it is estimated that stimulation must increase flow by roughly tons per $100,000 in order to be cost effective. Typically, hydraulic fracturing costs $100,000 to $500,000 per well, and the attempts at stimulation to date have generally not achieved the desired flow increases. The cost effectiveness of hydraulic fracturing is considered for several geothermal reservoirs.

## 1510 Direct Energy Utilization

*REFER ALSO TO CITATION(S) 2150, 2162, 2165, 2167*

2177 **(DOE/ET/27256—T38) Final administrative report for technology transfer and information dissemination, January 1, 1982-March 31, 1983.** Lienau, P.J. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Center). 1983. Contract FG07-79ET27256. 13p. NTIS, PC A02/MF A01. Order Number DE84001855.

The Geo-Heat Center was established in 1974 as a result of an International Geothermal Conference held at Oregon Institute of Technology for the purpose of providing an information exchange and technology transfer on the direct use of geothermal from both the USA and international sources. This was accomplished by establishing an information dissemination program, conducting applied research and working on site specific feasibility study projects in seven western states by means of a USDOE sponsored technical assistance program. This report covers the period from January 1, 1982 to March 31, 1983 which provided a public service in the form of a Quarterly Bulletin, technology transfer and a Region X Geothermal Report. The tasks accomplished are summarized.

2178 **(DOE/R4/10157—T1) Geothermal Project. Final report.** (Medical Univ. of South Carolina, Charleston (USA)). [nd]. Contract FG44-80R410157. 6p. NTIS, PC A02/MF A01. Order Number DE84000710.

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The project was designed to take 95°F water from an existing well and process it through a heat exchanger carrying supply water for our boiler make up and domestic hot water systems. The temperature of this water runs from 55°F to 65°F. In operation it was possible to raise the temperature of this water an average of

approximately 12°F. The amount of energy captured was recorded and it was found that one can capture approximately 199 x $10^6$ Btu/Mo. Using current energy costs and a boiler efficiency factor of .8 a potential annual savings of approximately $11,104/year was calculated. The total cost of the project was $31,893.68. Using these figures a simple pay back period of 2.9 years was calculated.

2179 **(DOE/SF/01326—T5) Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report.** (Geonomics, Inc., Berkeley, CA (USA)). Aug 1977. Contract AC03-77SF01326. 261p. NTIS, PC A12/MF A01. Order Number DE84002616.

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The different uses to which geothermal heat and fluids could be applied as a direct utilization of resource or as heat utilization are explored. The following aspects are covered: geotechnical assessment, agricultural and industrial applications, socioeconomic assessment, and engineering assessment. (MHR)

2180 **(EGG-M—11583) Description and operation of Haakon School geothermal-heating system.** Childs, F.W.; Kirol, L.D.; Sanders, R.D.; McLatchy, M.J. (EG and G Idaho, Inc., Idaho Falls (USA); USDOE Idaho Operations Office, Idaho Falls). 1983. Contract AC07-76ID01570. 6p. (CONF-831041—17). NTIS, PC A02/MF A01. Order Number DE84002227.

From 1983 Geothermal Resources Council's annual meeting; Portland, OR, USA (24 Oct 1983).

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To encourage the development of hydrothermal energy, twenty-three demonstration projects were funded. The Haakon School project is one of twelve such projects. The geothermal direct-use heating system at the Haakon School complex in Philip, South Dakota is described and information gained during approximately three heating seasons of operation is presented.

### 1520 Geothermal Data And Theory

*REFER ALSO TO CITATION(S) 2154, 2935*

## 16 TIDAL POWER

### 1608 Wave Energy Converters

*REFER ALSO TO CITATION(S) 2570*

2181 **(DOE/ET/20488—T1) Development of wave forecasting methods. Final report.** Pierson, W.J. (City Coll., New York (USA)). Oct 1980. Contract AC05-78ET20488. 144p. NTIS, PC A07/MF A01. Order Number DE84002393.

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After a brief discussion of the development of wave forecasting methods, the theory of the spectral ocean wave model (SOWM) is described. Efforts to verify the SOWM are described as well as sources of error. Effects are discussed that result from shallow water or occur near coasts, and the removal of spurious swell components is addressed. (LEW)

2182 **(SERI/TR—252-1765) Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter.** Penney, T. (Solar Energy Research Inst., Golden, CO (USA); Custom Engineering, Inc., Englewood, CO (USA)). Aug 1983. Contract AC02-77CH00178. 37p. NTIS, PC A03/MF A01. Order Number DE84000004.

This report describes the subsystems of a pneumatic wave energy converter (PWEC) and the various shakedown tests. It also lists some of the precautions and maintenance requirements needed to prevent catastrophic system failures. The appendices list previously undocumented drawings and references necessary to understand the design and development of this particular wave energy device. In summary, we found that a 125-kW/sub e/ PWEC was fabricated according to specification with mechanical and electrical subsystems functionally verified; instrumentation has been installed for future testing and is described; maintenance requirements are outlined; special operating warnings on equipment that can cause excessive damage or endanger the safety of people working around it are highlighted; no-load running torque and coast-down tests were performed on the gearbox/turbine and generator to quantify the moments of inertia used in dynamic analysis models.

2183 **(SI-R—780410-6) Simplified optimization and sensitivity analysis of focusing wave power plants.** Hysing, T. (Sentralinstitutt for Industriell Forskning, Oslo (Norway)). Nov 1981. 43p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751462.

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The results of the first rather crude optimization calculations and sensitivity analysis are presented for focusing ocean wave power installations. The model used is the basis for a computer program calculating the length of the focusing lens for the main installation cost per KWh produced for a given set of parameters. All calculations have been performed for a plant size of 200 MW, one site selected at the coast of Norway and one at the coast of Tasmania. The sensitivity analysis has been performed by a systematic variation of cost parameters and efficiency for the wave conditions described by the energy distribution of the wave components over a middle year. The main conclusions are that it would be possible to build wave power installations giving an energy cost of ca 50 oere/KWh in Norway and ca 25 oere/KWh in Tasmania refering to 1981 prices. 12 drawings, 2 tables.

2184 **(VERITAS-R—80-0045) Season variations of wave power in Norway.** Gran, S. (Norske Veritas, Oslo). Jan 1980. 33p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751463.

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Average wave power per month has been estimated for 18 meteorological stations in Norway. For 15 stations located at the coast and for the station at Bjoernoeya the estimates are valid at a distance of 20 nautic miles of the coast. The two last stations are the ocean weather ship "Polarfront" and the rescue vessel "Famita". The power estimates are derived from statistical distributions of significant wave height hindcasted from long series of visual sea state observations. For three stations the wave power distributions are compared with reported instrumental data. 19 drawings, 19 tables.

2185 **(VERITAS-R—81-0339) Wave motion and energy transmission derived from wave records.** Gran, S. (Norske Veritas, Oslo). Apr 1981. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751464.

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A method to retrace the two-dimensional orbital motion of the sea surface from Wave Rider buoy records has been demonstrated. Kinematical variables concerning wave pulsation and group transmission have been defined. Wave energy and energy transmission has been studied in the time domain and the connection to wave measurements has been pointed out. The study reveals that rather detailed information about the energy transmission in sea waves may be retrieved from a Wave Rider record. 9 drawings.

## 17 WIND ENERGY

### 1704 Economics

*REFER ALSO TO CITATION(S) 2570*

### 1705 Environmental Aspects

2186 **(SERI/TP—215-2009) Aerodynamic sources of acoustic radiation from a single MOD-2 wind turbine.** Kelley, N.D.; Hemphill, R.R.; McKenna, H.E. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1983. Contract AC02-77CH00178. 10p. (CONF-830622—27). NTIS, PC A02/MF A01. Order Number DE84000013.

From American Solar Energy Society meeting; Minneapolis, MN, USA (1 Jun 1983).

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Results are presented of an extensive acoustic measurement program conducted recently using one of the MOD-2 wind turbines in the DOE/NASA/BPA cluster at Goodnoe Hills, Washington. A summary of low-frequency acoustic emission characeristics is also presented. The MOD-2 acoustic emissions are compared with other large-scale turbines, including the DOE/NASA MOD-0A, the MOD-1 horizontal-axis, and the DOE/Sandia vertical-axis designs. The unsteady aerodynamic forcing, in response to certain freestream turbulence characteristics, is identified as the source of observed acoustic and rotor aeroelastic responses.

## 1706 Wind Energy Engineering

2187 **(DOE/ET/20320—T1) Some experiments on yaw stability of wind turbines with various coning angles.** Bundas, D.; Dugundji, J. (Massachusetts Inst. of Tech., Cambridge (USA). Aeroelastic and Structures Research Lab.). Jul 1981. Contract AI01-76ET20320. 31p. NTIS, PC A03/MF A01. Order Number DE83011009.

A horizontal axis wind turbine, 0.61-m (2.0-ft) diameter, was constructed to study the effect of coning angle on the yawing moments produced. Coning angles of 0°, +10°, and -10° were studied in the upwind and downwind cases. Moment and rotational frequency of the blades at each yaw angle setting were taken. It was found that as the coning angle was increased from -10° to +10° in either the upwind or downwind case the stability was decreased. Also, the downwind case was slightly more stable for all coning angles than was the upwind case. These findings are compared with theoretical predictions. It was found that all the previous cases were stable for high rotation speeds, but at lower rotation speeds, they were all unstable and could not self-start unless held in the wind.

2188 **(N—8325044) Performance of tornado-type wind turbines with radial inflow supply.** Hsu, C.T.; Ide, H. (Iowa State Univ. of Science and Technology, Ames (USA)). Sep 1982. 33p. NTIS, PC A03/MF A01.

Wind tunnel tests were conducted for the performance of tornado-type wind turbines with radial inflow supply from the incoming wind. It was shown that the radial inflow supply was necessary for intensifying a vortex in the wind collecting tower and, consequently, for enhancing the power efficiencies. A maximum power efficiency of 3.8 was obtained for a circular-shaped tower as compared to the value of 0.4 for the conventional windmills.

2189 **(NE—1983-15) Test plant for wind power Kalkugnen 1977-1980. Summary of operation results.** Forsgren, M.; Back, T. (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). May 1983. 54p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751419.

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The Swedish wind energy program included a test plant at Kalkugnen, district of Uppland. The wind power plant was erected 1977 and it was used for the measurements as follows: mechanical tests, stress analysis, electrical, accoustical meteorological measurements and to check television reception disturbance. The diameter of the turbine was 18 m, blades were made of aluminum and later of glass fiber reinforced plastics. The height of the tower was 23 m. The effect was limited to 60 kW at wind speed between 10 and 15 m per sec. The measured average value was 23 kW. The rest of the measurements rendered satisfactory results. While shifting the turbine the year 1980 to testing blades with carbon fiber reinforcement, the crane collapsed and the plant was destroyed.

# 20 ELECTRIC POWER ENGINEERING

*REFER ALSO TO CITATION(S) 2563*

## 2001 Power Plants And Power Generation

*REFER ALSO TO CITATION(S) 1751, 1810, 1898, 2191, 2585*

2190 **(CONF-830905—6) Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach.** Miliaras, E.S.; Kelleher, P.J.; Fujimura, K.S. (Energotechnology Corp., Cambridge, MA (USA); Southern California Edison Co., Rosemead (USA)). 1983. Contract FG01-82CE15094. 10p. NTIS, PC A02/MF A01. Order Number DE83017876.

From Joint power generation conference; Indianapolis, IN, USA (25 Sep 1983).

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Some of the capability lost during coal conversion can be recovered for midrange/peaking power generation through low cost, turbine cycle and economizer modifications. The additional output can be realized by shutting off adjacent high pressure feedwater heaters (as specified by turbogenerator manufacturers) and simultaneously increasing heat input to the economizer. The supplemental economizer heat input makes up for heat lost to the feedwater when extraction steam is shut off. Several options for applying this novel approach to capability recovery are described. The reclaimed capability is realized at somewhat lower efficiency but at low cost, compared to the overall cost of a coal conversion. Rather than return converted units to up to 100% oil or gas firing during periods of high system demand, the proposed method allows the continued comsumption of coal for the base-load portion of the plant's output. The development of the low NO/sub x/ Slagging Combustor will allow even the added economizer heat input to be supplied by relatively low cost coal. Following a brief review of factors affecting boiler capability in coal conversions and current approaches to coal conversion in this country and overseas, the results of a preliminary study that apply the proposed novel concept to a West Coast power plant are described.

2191 **(DOE/EA—0221) Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada.** (USDOE Economic Regulatory Administration, Washington, DC. Office of Fuels Programs). Oct 1983. 78p. NTIS, PC A05/MF A01. Order Number DE84002751.

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On 18 March 1982, SPPC filed a certification with the Secretary of Energy in accordance with Section 301(c) of FUA, as amended, that it is technically and financially feasible to use a mixture of petroleum or natural gas and coal as the primary energy sources in both units at the Fort Churchill Station. Through this certification, SPPC requested DOE to issue a prohibition order, in accordance with Section 301 of FUA, limiting the Fort Churchill units to no more than 30 percent of annual operating hours on petroleum or natural gas. A 30 percent mixture allowance is the minimum amount necessary to maintain reliability of operation of the units consistent with maintaining reasonable fuel efficiency of a petroleum or natural gas and coal mixture. SPPC proposes to modify the two Fort Churchill units to make them fully coal capable, while retaining their natural-gas and oil capabilities to meet contingency requirements. The principal modifications required for conversion to coal will include: (a) installation of a coal-handling system; (b) replacement or modification of most or all of the eight burners on each boiler unit with burners capable of firing oil, natural gas, or coal; (c) installation of a fly ash collection (baghouse), handling, and storage system; (d) installation of a bottom-ash handling and storage system; and (e) construction of a new stack. The principal objective of this EA is to provide appropriate consideration and analyses of environmental aspects of the proposed action and reasonable alternatives in order to determine whether an environmental impact statement will be required before a decision on the prohi-

bition orders can be made. A summary of environmental impacts as a result of conversion to coal is given.

2192 **(IDO—10109) Pumps-as-turbines experience profile.** Chappell, J.R.; Hickman, W.W.; Seegmiller, D.S. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 416p. NTIS MF A01. Order Number DE83001143.

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The report presents the results of a survey of owners, operators, consultants, engineering firms, and manufacturers to collect information on their experience in the use of pumps operating in reverse as turbines. The survey consisted of literature searches, telephone calls, questionnaires sent to selected individuals, conferences with consultants, and a few site visits by the authors. Information is presented on the types of pumps used, the method of estimating their performance, modifications required, actual results of field tests where available, economics, operation and maintenance, methods used for control, and sources for hardware and engineering assistance.

2193 **(N—8325037) IGCC performance comparison for variations in gasifier type and gas turbine firing temperature.** Stochl, R.J.; Nainiger, J.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Jan 1983. 40p. (NASA-TM—83310; E—1549). NTIS, PC A03/MF A01.

Performance estimates were made for a series of integrated coal gasification combined cycle (IGCC) power systems using three generic types of coal gasification subsystems. The objectives of this study were (1) to provide a self consistent comparison of IGCC systems using different types of gasifiers and different oxidants and (2) to use this framework of cases to evaluate the effect of a gas turbine firing temperature and cooling approach on overall system efficiency. The basic IGCC systems considered included both air and oxygen blown versions of a fluidized bed gasifier, represented by the Westinghouse design, and an entrained bed gasifier, represented by the Texaco design. Also considered were systems using an oxygen blown, fixed bed gasifier, represented by the British Gas Corporation (BGC) slagging gasifier. All of these gasifiers were integrated with a combined cycle using a gas turbine firing temperature of 1700 K (2600 F) and a compressor pressure ratio of 16:1. Steam turbine throttle conditions were chosen to be 16.6 MPa/811 K (2400 psia/1000 F) with a single reheat to 810 K (1000 F). Some of these cases were modified to allow the evaluation of the effect of the gas turbine firing temperature. Turbine firing temperatures from state of the art 1365 K (2000 F) to an advanced technology 1920 K (3000 F) were analyzed. A turbine cooling technology that maintains metal temperatures below acceptable limits was assumed for each level of firing temperature. System performance comparisons were made using three advanced turbine cooling technologies for the 1920 K (3000 F) firing temperature. The results indicate that the IGCC using the BGC gasifier had the highest net system efficiency (42.1 percent) of the five gasification cases considered.

2194 **(NP—3770428) Heat technological investigations on plastic heat exchangers for dry type natural draught cooling towers.** Pollack, H. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 22 May 1981. 72p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83770428.

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By means of the present study additional fundamental data for plastic heat exchangers to be used in natural draft dry cooling towers will be made available. For this purpose published regularities for heat transfer and pressure loss in plate- and base-tube bundle-type heat exchangers have to be experimentally checked in different designs and, if necessary, extended or improved with respect to accuracy. The influence of the thermal and flow performance on the design of natural draft dry cooling towers is described by means of the results of design calculations for the system heat exchanger/natural draft dry cooling tower. Approximative cost evaluations will allow to compare various solutions with each other and to answer the question to what extent plastics heat exchangers in natural draft dry cooling towers may be an alternative to the finned-tube systems used today.

2195 **Helium approach to leak detection.** McKee, C.; Kolar, M.; Mundis, J.; Coit, R. *EPRI (Electric Power Research Institute) Journal;* 8: No. 7, 28-30(Sep 1983).

Research application.

Locating a tiny leak in a 70,000-tube condenser can be like looking for a needle in a haystack. A faster, more-sensitive method that uses helium as a tracer gas is now in service at over 100 utilities. 1 figure.

## 2002 Environmental Aspects

*REFER ALSO TO CITATION(S) 2671, 2968, 3409*

2196 **Particulates: caught at the filter line.** Nesbit, W.; Carr, R. *EPRI (Electric Power Research Institute) Journal;* 8: No. 7, 14-21(Sep 1983).

The dustcake captured on the inside of a fabric filter is the key to baghouse performance and the focus of recent research. Utility interest and confidence in this technology are growing rapidly. 5 references, 1 figure.

## 2003 Power Transmission And Distribution

2197 **(EFI-TR—2742) Digital substation control systems in the electricity supply. System description.** Grande, O.S.; Aarebot, A. (Elektrisitetsforsyningens Forskningsinstitutt, Trondheim-NTH (Norway)). Jul 1981. 49p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751459.

The report describes how a transmission substation control installation could be built and developed in steps into a complete digitalized and integrated consept including protection systems. Microprocessors and modern data communications are central building blocks. 10 drawings.

2198 **Control system for a wound-rotor motor.** Ellis, J.N. (to Dept. of Energy). US Patent 4,388,579. 14 Jun 1983. Filed date 17 Jul 1981. vp.

PAT-APPL-284158.

A load switching circuit for switching two or more transformer taps under load carrying conditions includes first and second parallel connected bridge rectifier circuits which control the selective connection of a direct current load to taps of a transformer. The first bridge circuit is normally conducting so that the load is connected to a first tap through the first bridge circuit. To transfer the load to the second tap, a switch is operable to connect the second bridge circuit to a second tap, and when the second bridge circuit begins to conduct, the first bridge circuit ceases conduction because the potential at the second tap is higher than the potential at the first tap, and the load is thus connected to the second tap through the second bridge circuit. The load switching circuit is applicable in a motor speed controller for a wound-rotor motor for effecting tap switching as a function of motor speed while providing a stepless motor speed control characteristic.

2199 **Some characteristics of dielectric materials at cryogenic temperatures for HVDC systems.** Chowdhuri, P. (Los Alamos Scientific Lab., NM). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electrical Insulation;* **EI-16**: No. 1, 40-51(Feb 1981).

This dielectric study was performed as part of the dc Superconducting Power Transmission Line Program. During a screening test program, the dc breakdown strength of 12 dielectric materials, in sheet form, was determined at 12 K under 1.38 MPa of helium pressure, the operating conditions of the cable design. Tests were also made with four of these materials impregnated with mineral oil. Further dc breakdown tests were performed on five of these dielectric materials at various temperatures (12 to 298 K) and pressures (0.69 and 1.38 MPa) of helium. Two sets of experiments were performed on cellulose paper impregnated with distilled water at 83 K and 1.38 MPa of helium pressure. Five dielectric materials were then selected for tests as cable samples with dc and impulse voltages at 12 K and 1.38 MPa of helium. Data are presented on these tests, as well as on those of the electrical conductivity of four di-

electric materials at cryogenic temperatures, and of the surface flashover strength of an epoxy bushing at 12 K and 298 K under 0.69 MPa and 1.38 MPa of helium pressures. The characteristics of the dielectric behavior at cryogenic temperatures are discussed.

# 21 NUCLEAR POWER PLANTS

*REFER ALSO TO CITATION(S) 2493, 2499*

2200 **(AD-P—001593/3) Utility considerations in emotional stability monitoring for nuclear plant personnel.** Davis, S.L. (Personnel Decisions Research Inst., Minneapolis, MN (USA)). 16 Nov 1982. 9p. NTIS, PC A02/MF A01.

The most effective behavioral reliability programs include four elements: (1) behavioral criteria of unreliability, (2) professional judgement, (3) training, and (4) employee assistance program. Some data exists which show more acts of sabotage, theft, or vandalism occur in environments in which screening hurdles are minimal and other security precautions are minimal. A behavioral reliability program must include training in observation skills for the individuals charged with the responsibility of ensuring reliability of their subordinates. It must be linked with a screening program through definition of criteria and the judgment of a professional psychologist or psychiatrist who knows the job environment. Finally, it must provide resources for the employee or individual who, once screened in, is now denied access.

## 2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

*REFER ALSO TO CITATION(S) 1922, 2228, 2308, 2341, 2345, 2397, 2404, 2406, 2409, 2411, 2413, 2429, 2438, 2440, 2445, 2446, 2447, 2448, 2450, 2451, 2452, 2453, 2456, 2465, 2494, 2506, 2510*

2201 **(DOE/ET/34006—9) Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system.** Blair, T.R. (Exxon Nuclear Co., Inc., Richland, WA (USA)). Jul 1983. Contract AC02-79ET34006. 117p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE84000853.

This report describes the design of an intrinsic germanium (IG) detector poolside gamma scanning system developed under the EDB program and the results obtained during the first poolside use at Big Rock Point. Gamma scanning of irradiated fuel rods with a high energy resolution detector can provide important information about fuel performance. The state-of-the-art IG detectors make this type of poolside scanning considerably more attractive than in the past. The data yield information about fission gas release, pellet stack heights, pellet gaps, and measured relative burnups.

2202 **(EUR—7373) Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report.** Golinelli, C. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 20p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703770.

The research and development program in the area of plutonium recycling in light water reactors has led the European Communities Commission to finance in part an experimental program for the qualification of project calculation methods applied to cores with mixed uranium-plutonium fuels. The experiments carried out in MINERVE provide the data required for the distribution of power in the assemblies with different types of heterogeneities: water holes, absorbants, $UO_2/UO_2PuO_2$ interface, for the efficiencies of different absorbants and in particular silver, indium, cadmium and for the Doppler effect. The experiments carried out in EOLE involve the determination of the temperature effect of the moderator from 20°C to 300°C (CREOLE programme). The totality of the results shows that the calculation scheme must be refined with respect to the value of the hot spots, and that the uncertainties on the feedback of the reactors can be reduced.

2203 **(EUR—7603) Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings.** Golinelli, C. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703762.

The Commission of the European Communities has sponsored three sets of experiments with a contract in the framework of the LWR plutonium recycling programme. The aim of this experimental programme was to supplement the qualification of the computer codes used in connection with control and safety studies relating to plutonium recycling in LWR power stations. The experiments are performed at the Cadarache centre by CEA and EdF in the MINERVE and EOLE facilities. The power distributions in various kinds of assemblies with some heterogeneities (water holes, absorbers, $UO_2/UO_2$-$PuO_2$ interfaces) are studied in MINERVE as well as the DOPPLER effect. This second programme consisted in oscillating the $UO_2$ and $UO_2$-$PuO_2$ samples which were heated between 20°C and 800°C. The CREOLE experiments in EOLE dealt with the moderator temperature effect from 20°C to 300°C. All the results show that the calculation schema for the hot point values must be sophisticated and that it is possible to reduce the uncertainties concerning the feedback factors.

2204 **(FEI—1172) Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling.** Kornienko, Yu.N.; Kuzevanov, V.S.; Selivanov, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703768.

A mathematical model of nonstationary heat transfer and hydrodynamics processes as well as a technique for calculating characteristics of boiling nuclear reactor coolant circuit are suggested. The model takes into account the coolant thermodynamic non-equilibrium and profiles of steam content enthalpy and phase velocity distributions over two-phase flow section. Profiles of the parameter distribution are taken into account by means the averaging coefficients introduced in basic equations of conservation. Fuel element temperature is calculated on the basis of analytical solution of nonstationary heat transfer equation for the fuel element average temperature. The technique described is realized in the form of the NAKRA program for the BESM-6 computer. It is concluded that the model suggested and the NAKRA program describe satisfactorily characteristics observed experimentally and can be used for studying dynamic regims and stability of nuclear power plants.

2205 **(HEDL-SA—2860-FP) Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders.** Ruddy, F.H.; Roberts, J.H.; Gold, R.; Preston, C.C. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1983. Contract AC06-76FF02170. 14p. (CONF-830969—7). NTIS, PC A02/MF A01. Order Number DE84001476.

From 12. international conference on solid state nuclear track detectors; Acapulco, Mexico (4 Sep 1983).

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The accumulation of neutron dose by the pressure vessel of an operating nuclear power plant results in damage in the form of steel embrittlement. In order to ascertain the safe operating lifetime of the reactor pressure vessel, dosimetric measurements must be made to evaluate the neutron dose to the pressure vessel and relate this dose to the cumulative radiation damage. Advanced dosimetry techniques are being evaluated for surveillance of operating reactors. Solid-state track recorder (SSTR) techniques are included among these advanced dosimetry techniques. Described herein are low neutron fluence calibration and standardization measurements that are being carried out in pressure vessel mockup benchmark neutron fields in the USA, Belgium, and England. In addition, high fluence SSTR dosimetry capsules have been irradiated with metallurgical specimens in a pressure vessel mockup facility. The design and deployment of advances SSTR dosimetry capsules in operating power reactors are also described.

2206 (IAEA-SR—72, pp 56-73) **Need for revising US Nuclear Regulatory Commission Regulatory Guide 1.52 in light of NRC-sponsored research program results and other developments.** Bangart, R.L. (Nuclear Regulatory Commission, Washington, DC (USA)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/32).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The results of U.S. Nuclear Regulatory Commission (NRC)-sponsored research at the U.S. Naval Research Laboratory on the Effects of Weathering on Impregnated Charcoal Performance and Charcoal Performance Under Accident Conditions are important factors which contribute to the need for revision of Regulatory Guide 1.52. This research has shown that the type of impregnant greatly influences the weathering characteristics of the charcoal and that at least some weathered charcoals show improved performance after radiation exposures in the range of $10^7$ to $10^9$ rads. Several other factors are influencing the decision to revise and will influence the subsequent timetable for revision. Among these factors are: a) NRC endorsement, in whole or in part, of ANSI/ASME N509-1980 and ANSI/ASME N510-1980, needs to be accomplished; b) questions to the NRC have been raised addressing the appropriateness of its present position of not requiring HEPA filters testing at Department of Energy Quality Assurance Testing Stations; c) potential carcinogenesis of DOP; and d) post TMI-2 accident-related concerns. The paper discusses the disadvantages of not initiating another revision to Regulatory Guide 1.52, work priorities within the NRC competing with the need to revise this Regulatory Guide, and preliminary positions on certain issues (endorsement of N509/N510, e.g.) that are appropriate for consideration in the draft of a proposed Revision 3 to Regulatory Guide 1.52.

2207 (IAEA-SR—72, pp 206-219) **Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation.** Deuber, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/21).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Results are presented of measurements of the $^{131}I$ release rates in the exhaust air streams of a German pressurized water reactor (PWR2) and boiling water reactor (BWR4) during normal operation. In particular, these results illustrate that the effectiveness of $^{131}I$ retention with respect to the environmental impact may be rather limited by filtration with high decontamination factors of e.g. one exhaust air stream with high $^{131}I$ release rates and no filtration at all of other exhaust air streams.

2208 (IAEA-SR—72, pp 432-460) **Design, operation and in-plant testing of off-gas cleaning systems at BWRs.** Komurka, M. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H. Inst. fuer Reaktorsicherheit). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/35).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Design maintenance and testing criteria for atmosphere clean-up systems for normal and post-accidental situations in LWR power plants are briefly described. It is indicated that the new assumptions in the activity sources term might require a certain re-evaluation of the currently used regulatory framework. The regulations currently used do not require the testing of either charcoal or charcoal delay lines used in gaseous radwaste processing systems. Therefore the design and operation of a gaseous radwaste processing system for a BWR is described in more detail. A description of both the initial in-situ testing and the periodical testing of the delay line is given. The problems which should be considered by these tests are discussed in connection with the results obtained by an in-situ test of a delay line with Kr85.

2209 (IAEA-SR—72, pp 220-247) **Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system.** Madoz, J.P. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Surete Nucleaire); Decourciere, P. (Electricite de France, 92 - Courbevoie. Service Etudes et Projets Thermiques et Nucleaires). May 1983. (In French). NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/10).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

This paper presents the conception principles retained in order to insure the function "iodine trapping" of the 1300 MWe light water reactor's ventilation systems. These principles are the following: treatment of the gaseous waste flow restricted to the building with iodine contamination risk; bypassing of the iodine traps in the case of normal reactor operation with the possibility of a quick tilting in the case of iodine risk; use of the heaters before the traps; use of iodine reloading traps; use of an important activated carbon thickness. Systems of ventilation, together with their iodine traps, are presented.

2210 **(INIS-mf—8416) Secondary systems of PWR and BWR.** Schindler, N. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 46p. (CONF-8109220—29). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703311.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The secondary systems of a nuclear power plant comprises the steam, condensate and feedwater cycle, the steam plant auxiliary or ancillary systems and the cooling water systems. The presentation gives a general review about the main systems which show a high similarity of PWR and BWR plants.

2211 **(INIS-mf—8466) Safety systems of heavy water reactors and small power reactors.** Meyer, P.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 67p. (CONF-8109220—39). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703322.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

After introductional descriptions of heavy water reactors and natural circulation boiling water reactors the safety philosophy and safety systems like ECCS, residual heat removal, protection systems etc., are described.

2212 **(UCRL—86246) Reliability analysis for stiff versus flexible piping.** Lu, S.C. (Lawrence Livermore National Lab., CA (USA)). 21 Oct 1983. Contract W-7405-ENG-48. 19p. (CONF-8310143—25). NTIS, PC A02/MF A01. Order Number DE84002713.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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A confirmatory piping reliability assessment for stiff versus flexible piping systems indicated that removing rigid supports tends, in general, to reduce thermal stress but to increase seismic stress in the pipe. As a result, piping design can be made more reliable by some reduction of rigid supports. It was also observed that piping design using snubbers among support devices may not exhibit the intended reliability because snubbers often fail to perform the desired function. It was demonstrated that certain piping systems with snubbers removed actually exhibit higher reliability than do those of the original design.

2213 **(ZfK—494) Evaluation of neutron flux density and power density with SPN-detectors and micro calorimeters. A comparison.** Gehre, G.; Rindelhardt, U.; Seidenkranz, T.; Hogel, J.; Jirousek, V.; Vazek, J. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Feb 1983. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703767.

During investigations with a special equipped fuel assembly in the Rheinsberg nuclear power station the neutron flux and the power density were evaluated from measurements with SPN-detectors and micro calorimeters. The reliability of both detector types, their measurement accuracy under different physical conditions and the usefulness of the developed calculation models are discussed in detail. The thermal flux and the power density evaluated with SPND's agree well with theoretical results. The values obtained through micro calorimeter measurements are systematic lower by about 18%. This deviation is probably a result of differences in the used calculation models.

2214 **Conceptual design of a fuel assembly for extended operational cycle length in LWRs.** Aoyama, M.; Hiramoto, K.; Miki, K.; Takeda, R.; Uchikawa, S. (Hitachi Ltd., Energy Research Laboratory, 1168 Moriyama-cho, Hitachi-shi, Ibaraki, 316). *Transactions of the American Nuclear Society;* **44**: 107(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2215 **BWR fuel channels performance up to 2000 EFPD.** Garzarolli, F.; Knaab, H.; Knecht, K. (KWU, Hammerbacherstrasse 12 04 14, D-8520 Erlangen). *Transactions of the American Nuclear Society;* **44**: 239-240(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2216 **Experimental evidence suppporting two-mechanism critical heat flux.** France, D.M.; Chiang, T.; Carlson, R.D.; Priemer, R. (Argonne National Lab., IL). *International Journal of Heat and Mass Transfer;* **25**: No. 5, 691-698(1982).

Critical heat flux (CHF) experiments were performed in a high pressure, forced convection, boiling water facility employing flowing sodium as the heating medium. Water pressure ranged from 7.0 to 15.3 MPa, and the water mass flux ranged from 0.72 to 3.2 $Mg/m^2s$. Measurements were made of temperature fluctuations in the test section tube wall, adjacent to the transition boiling region downstream of CHF, with two thermocouples diametrically opposed at the same axial position. The temperature recordings indicated an abrupt change in hydrodynamic flow structure occurring at the same critical heat flux values where previously obtained CHF data exhibited abrupt changes in trend from heat flux dependent to heat flux independent. These results strongly support the two CHF mechanisms hypothesis and the associated CHF data trend representation for empirical curve fits to CHF data.

2217 **American National Standard: containment-system leakage-testing requirements.** La Grange Park, IL; American Nuclear Society (1981). 47p. (ANSI/ANS—56.8-1981). American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525 $30.00.

The provisions of this standard specify the minimum acceptable primary reactor containment system leakage rate test requirements to assure valid testing. The scope includes: test methods, test criteria, test procedures, scheduling of tests, inspection and reporting of test results, test equipment, and data analysis.

2218 **American National Standard: design requirements for light-water-reactor fuel-handling systems.** La Grange Park, IL; American Nuclear Society (1980). 18p. (ANSI/ANS—57.1-1980). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $20.00.

This standard defines the required functions of fuel handling systems at light water reactor nuclear power plants. It provides minimum design requirements for equipment and tools for safe handling of nuclear fuel and control components at light water reactor nuclear power plants. The fuel handling system covered by this standard consists of handling equipment used for receiving and inspecting fuel containing new and recycled uranium; transporting on-site and loading fuel containing new and recycled uranium or irradiated fuel and control components in the reactor; removing from the reactor, transporting to storage, and inspecting irradiated fuel and loading casks for shipment of irradiated fuel from the site. It includes basic requirements and configuration for design, fabrication, maintenance, and operation. The basis of this standard is that the intended function of the equipment will be performed in an efficient and economical manner that assures protection to plant personnel and to the public, and that any radiation exposurers are maintained as low as reasonably achievable.

2219 **American National Standard: fuel-assembly identification.** La Grange Park, IL; American Nuclear Society (1978). 9p. (ANSI/ANS—57.8-1978). American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525 $9.00.

This Standard describes requirements for the unique identification of fuel assemblies utilized in nuclear power plants. It was developed primarily for commercial light-water reactor fuel, but may be used for any reactor fuel contained in discrete fuel assemblies that can be identified with a serial number as specified by this Standard. This Standard defines the characters and proposed sequence to be used in assigning identification to the fuel assemblies. The identification shall be borne by the fuel assembly during its lifetime.

2220 **American National Standard: overpressure protection of low-pressure systems connected to the reactor-coolant pressure boundary.** La Grange Park, IL; American Nuclear Society (1977). 14p. (ANSI/ANS—56.3-1977). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $12.00.

The purpose of this Standard is to specify minimum requirements for the overpressure protection of low pressure systems connected to the reactor coolant pressure boundary of light-water-cooled nuclear power plants. The provisions of this Standard shall be compiled with in the design of the light water-cooled nuclear power plant.

## 2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

*REFER ALSO TO CITATION(S) 1922, 1932, 2196, 2197, 2199, 2200, 2201, 2203, 2204, 2206, 2211, 2212, 2213, 2214, 2304, 2305, 2308, 2335, 2343, 2345, 2398, 2399, 2402, 2403, 2404, 2405, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2425, 2429, 2432, 2433, 2434, 2438, 2439, 2440, 2441, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2457, 2458, 2459, 2460, 2465, 2480, 2491, 2506, 2510, 2745, 3090, 3174*

2221 **(BNL-NUREG—33657) Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water.** Bandy, R.; van Rooyen, D. (Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-76CH00016. 18p. (CONF-830845—7). NTIS, PC A02/MF A01 - GPO. Order Number DE84000623.

From Environmental degradation of materials in nuclear power systems-water reactors; Myrtle Beach, SC, USA (22 Aug 1983).

Results of stress-corrosion cracking data are presented for Inconel 600 steam-generator tubing. U-bend, constant-load, and slow extension-rate tests are included. Arrhenius plots are presented for failure times vs inverse temperature for crack initiation and propagation. Effect of applied load is expressed in terms of log-log curves for failure times vs stress, and variations in environment and cold work are included. Microstructure and composition of oxide films on Inconel 600 surfaces were examined after exposure to pure water at 365°C, and stripping with the bromine-methanol method. Results are discussed in terms of transient creep, film rupture and a mass-transport-limited anodic process.

2222 **(DOE/ET/34020—4) Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983.** Kochendarfer, R.A. (Babcock and Wilcox Co., Lynchburg, VA (USA). Utility Power Generation Div.). Nov 1983. Contract AC02-79ET34020. 28p. (BAW—1643-4). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84002350.

The Babcock and Wilcock Company and the Sacramento Municipal Utility District under the direction of the United States Department of Energy are participating in an axial blanket fuel demonstration program as part of a national effort to improve uranium utilization in light water reactors. The goal of the program is

to design and irradiate an entire core of axial blanket fuel assemblies in a commercial pressurized water reactor. This report, covering April 1982 through March 1983, is the fourth progress report for the program. A major milestone was attained in this timeframe with the completion of the first cycle of irradiation of four axial blanket lead test assemblies in the Rancho Seco cycle 5 core on February 17, 1983. The axial power characteristics of both an axial blanket lead test assembly and a symmetric standard (non-blanketed) assembly were monitored by a movable in-core detector system. This detector system provided measured data to bench mark core physics models. The measured powers obtained from this system and the on-line computer agreed well with those predicted by the models.

2223 **(DOE/ET/34212—40) Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982.** Newman, L.W.; Thornton, T.A.; Wrona, B.J.; Harrison, J.L.; Baldwin, M.N.; Hoovler, G.S.; Hannah, M.A.; Mason, F.L.; Connell, J.D.; Holman, P.L. (Babcock and Wilcox Co., Lynchburg, VA (USA); Babcock and Wilcox Co., Alliance, OH (USA). Contract Research Div.; Duke Power Co., Charlotte, NC (USA)). Sep 1983. Contract AC02-78ET34212. 69p. (BAW—1681-3). NTIS (US Sales Only), PC A04/MF A01. Order Number DE84002333.

The Babcock and Wilcox Company, Duke Power Company, and the US Department of Energy are participating in an extended-burnup program for pressurized water reactors that will demonstrate an advanced fuel assembly design. This report, covering April through September 1982, is the third semi-annual progress report for the program. During this report period, the basic $UO_2$-$Gd_2O_3$ fabrication process that includes adding a poreformer (Acrawax) was established. Adding 0.5 wt % of atomized Acrawax to the $UO_2$-$Gd_2O_3$ mixture in the re-blend stage improves the pressability and strength of the green pellets and stabilizes the densification characteristics of the sintered pellets. Comparisons of the EPRI-ARMP code predictions with data from the $UO_2$-$Gd_2O_3$ critical experiments were also completed. These comparisons gave added assurance that the ARMP system can be used to analyze and design gadolinia-loaded pressurized water reactor assemblies. Standard B and W licensing models were used in designing cycle 8 of Oconee 1 - the first cycle of irradiation for five lead test assemblies.

2224 **(EUR—7599) Fabrication, irradiation and post-irradiation examinations of $MO_2$ and $UO_2$ sphere-pac and $UO_2$ pellet fuel pins irradiated in a PWR loop.** Linde, A. van der; Lucas Luijckx, H.J.B.; Verheugen, J.H.N. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 270p. NTIS (US Sales Only), PC A12/MF A01. Order Number DE83703771.

The document reports in detail the fuel pin fabrication data and describes the irradiation conditions and history. All the relevant results of the non-destructive and destructive post-irradiation examinations are reported. They include: visual inspection and chemical analysis of crud; length and diameter measurements; neutron radiography and gamma scanning; juncture tests and fission gas analysis (including residual gas in fuel samples); microscopy and alpha + beta/gamma autoradiography; microprobe investigations; burn-up and isotopic analysis; and hydrogen analysis in clad. The data and observations obtained are discussed in detail and conclusions are given. The irradiation and post-irradiation examinations of the R-109 pins have shown the safe, pre-calculable performance of LWR fuel pins containing mixed-oxide sphere-pac fuel with the fissile material mainly present in the large spheres.

2225 (IAEA-SR—72, pp 461-468) **Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations.** Tuominen, J.; Hirvonen, J. (Imatran Voima Oy, Helsinki (Finland)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/8).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Imatran Voima Oy (IVO) is a Finnish power company in possession of two 440 MWe PWR nuclear power stations at Loviisa. The reactor primary and auxiliary systems were delivered mainly from the Soviet Union. The off-gas system consists of ambient temperature charcoal beds and iodine filters. Active gases from degasifier and tanks connected with the primary circuit pass before delay through the hydrogen recombiner. Regeneration gases from a desiccant dryer are led through iodine filters. Gases from other active tanks pass through a scrubber and an iodine filter. According to the Finnish regulations, the off-gas iodine filters must have a decontamination factor of minimum 99 percent for methyliodide. The iodine filters are to be tested after 3000 h of operation. Because of unsatisfactory test results, the filtration material of the iodine filters have been changed twice. The problems involved in these cases were moisture or chemical penetration to the filter.

2226 **(INIS-mf—8409) Auxiliary systems.** Meyer, P.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 32p. (CONF-8109220—31). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703313.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

Systems included under the heading "Reactor Auxillary Systems" are those immediately involved with the reactor operation. These include the systems for dosing and letdown of reactor coolant, as well as for the chemical dosing, purification and treatment of the reactor coolant and the cooling system in the controlled area. The ancillary systems are mainly responsible for liquid and gaseous treatment and the waste treatment for final storage.

2227 **(INIS-mf—8420) Water systems.** Riess, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 52p. (CONF-8109220—35). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703317.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The present paper describes the coolant chemistry and its consequences for 1300 MWsub(e) KWU PWR plants. Some selected systems, i.e. primary heat transport system, steam water cycle and cooling water arrangements, are chosen for this description. Various aspects of coolant chemistry regarding general corrosion, selective types of corrosion and deposits on heat transfer surface have been discussed. The water supply systems necessary to fulfill the requirements of the coolant chemistry are discussed as well. It has been concluded that a good operating performance can only be achieved when - beside other factors - the water chemistry has been given sufficient consideration.

2228 **(INIS-mf—8421) Procedures for maintenance and repairs.** Pickel, E. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 99p. (CONF-8109220—36). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703318.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

After a general review of the operation experience in the history of more than 12 operating years, the organization in the plant will be shown with special aspect to quality assurance, capacity of the workshops and connected groups as radiation protection, chemical laboratories etc. The number, time intervals and manpower effort for the repeating tests will be discussed. Reasons and examples for back-fitting activities in the plant are given. Besides special repair and maintenance procedures as repair of the steam generators, in-service inspection of the reactor pressure vessel, repair of a feed-water pipe and repair of the core structure in the pressure vessel, the general system to handle maintenance and repair-work in the KWO-plant will be shown. This includes also the detailed planning of the annual refueling and revision of the plant.

2229 **(INIS-mf—8439) Workshop on safety analysis reports and licensing procedures. Pt. 1** A. Albrecht, E. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 58p. (CONF-8109220—37-Pt.1A). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703319.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The present paper gives descriptions of the residual heat removal system and of the controlled access area ventilation system for a four loop PWR.

2230 **(INIS-mf—8464) Chemical operating experience in several European pressurized water reactor plants.** Riess, R.; Schroeder, H.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 39p. (CONF-8109220—38). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703320.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

In the last decade the number lightwater cooled nuclear power stations in Europe has increased considerably. This has also increased our knowledge of the behaviour of constructional materials, water qualities and the influence of the design on the operating performance of these plants. The present paper reviews some aspects of the obtained experiences.

2231 **The design, construction, and operation of a working PWR primary loop simulator.** Stevenson, B. (New Jersey Institute of Technology, 323 High Street, Newark, NJ 07102). *Transactions of the American Nuclear Society;* **44**: 40-41(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2232 **High-reliability PWR fuel.** Walton, L.A.; Pyecha, T.D. (Babcock & Wilcox Company, P.O. Box 1260, Lynchburg, VA 24505). *Transactions of the American Nuclear Society;* **44**: 80-82(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2233 **Reliability breeds standardization in Combustion Engineering's fuel design.** Andrews, M.G. (Combustion Engineering, Inc., 1000 Prospect Hill Road, Windsor, CT 06095). *Transactions of the American Nuclear Society;* **44**: 82-83(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2234 **Fuel designs for light water reactors.** Morgan, J.N. (Exxon Corporation, 1899 L Street, N.W., Washington, DC 20036). *Transactions of the American Nuclear Society;* **44**: 83(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2235 **Benefits of extended burnup cycles at Arkansas Nuclear One-2.** Matzie, R.A.; Beers, S.C.; Decher, U.; Freeman, R.S.; Greene, M.A. (Combustion Engineering, Inc., 1000 Prospect Hill Road, Windsor, CT 06095). *Transactions of the American Nuclear Society;* **44**: 105-106(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2236 **Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data.** Guthrie, G.L. (Westinghouse Electric Corporation, Hanford Engineering Development Laboratory, P.O. Box 1970, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 222-223(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2237 **An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels.** Varsik, J.D. (Combustion Engineering, Inc., 1000 Prospect Hill Road, Windsor, CT 06095). *Transactions of the American Nuclear Society;* **44**: 223-224(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2238 **Reduction of numerical diffusion errors in thermal mixing predictions.** Hassan, Y.A.; Kim, J.H.; Rice, J.G. (Babcock & Wilcox Company, P.O. Box 1260, Lynchburg, VA 24505). *Transactions of the American Nuclear Society;* **44**: 261-262(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2239 **Low-density moderation in PWR fuel storage.** Roshd, M.; Doutriaux, D.; Zero, S. (Framatome, Tour Fiat, 1 place de la Coupole, 92084 Paris la Defense). *Transactions of the American Nuclear Society;* **44**: 287-288(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2240 **Quality assurance activities of PWR plants in Japan.** Fujiwara, K.; Moriyama, A. (Mitsubishi Atomic Power Industries, Inc., 1-297, Kitabukuro, Omiya, Saitama 330). *Transactions of the American Nuclear Society;* **42**: 108-109(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2241 **Power distribution and fuel depletion calculation for a PWR, using LEOPARD and CITATION codes.** Batista, J.L. Sao Paulo, Brazil; Instituto de Pesquisas Energeticas e Nucleares (1982). 133p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

By modifying LEOPARD a new program, LEOCIT, has been developed in which additional subroutines prepare cross-section libraries in 1, 2 or 4 energy groups and subsequently record these on disc or tape in a format appropriate for direct input to the CITATION code. Use of LEOCIT in conjunction with CITATION is demonstrated by simulating the first depletion cycle of Angra Unit 1. In these calculations two energy groups are used in 1/4, X - Y geometry to give the soluble boron curve, the fuel depletion and the point to point power distribution in Angra 1. Finally relevant results obtained here are compared with those published by Westinghouse, CNEN and Furnas and recommendations are made to improve the system of neutronic calculation developed in this work. (Author).

2242 **Model to simulate the dynamic of a PWR pressurizer using the CSMP program.** Woiski, E.R. Sao Paulo, Brazil; Instituto de Pesquises Energetices e Nucleares (1981). 130p. (In Portuguese). IPEN, Sao Paulo, Brazil.

A mathematical model has been developed to simulate the dynamic behavior of a PWR pressurizer using the CSMP program. A two-control-volume formulation non-equilibrium model has been used for this purpose. Thermodynamic states are obtained after each integration cycle. The code was tested against experimental results of Shippingport and NPD (Nuclear Power Demonstration Plant) pressurizers. It was also tested against available data from Angra I and Angra II/III safety analysis report. Despite the model simplicity, the lack of important data and the low reliability or the experimental curves, the calculated and experimental results compared well.

2243 **Application of crack arrest theory to a thermal shock experiment.** Cheverton, R.D. (Oak Ridge National Lab., Tn); Gehlen, P.C.; Hahn, G.T.; Iskander, S.K. pp 392-421 of Crack arrest methodology and applications. Hahn, G.T.; Kanninen, M.F. (eds). Philadelphia, PA; American Society for Testing and Materials (1980). Contract W-7405-ENG-26.

This paper presents evaluations of the onset of fracture and crack arrest in a thick-walled A508 steel cylinder (530-mm outside diameter, 240 mm inside diameter and 910 mm long) for thermal shock loading conditions similar to those postulated for a nuclear reactor vessel. The evaluations include static finite-element as well as static and dynamic finite-difference analyses of the flawed cylinder. The calculated values of the stress-intensity factor at initiation and at arrest are compared with the fracture toughness (K/sub Ic/) and crack arrest toughness (K/sub Im) values obtained from small specimens tested at the same temperatures. The stress-intensity factor at initiation agrees with K/sub Ic'/ while the stress-intensity factor at arrest is less than K/sub Ic/ and consistent with estimates of K/sub Im/. Dynamic effects (such as inertial effects) at arrest are negligible, and the static and dynamic analyses give the same result for the rather small (12 mm) crack extension experienced by the vessel. However, a dynamically calculated large (93 mm) crack

extension for a hypothetical brittle steel is 52 percent longer than predicted by the static analysis. It follows that dynamic effects may not be negligible for very deep penetrations of the vessel wall.

## 2103 Power Reactors, Non-breeding, Graphite Moderated

*REFER ALSO TO CITATION(S) 2314, 2435, 2440, 2814*

2244 **(GA-A—16807) TRISO-coated HTGR fuel pressure-vessel performance models.** Kovacs, W.J.; Bongartz, K.; Goodin, D. (GA Technologies, Inc., San Diego, CA (USA)). Oct 1983. Contract AT03-76ET35300. 122p. NTIS, PC A06/MF A01. Order Number DE84002560.

This report describes a unified GA Technologies Inc. (GA - formerly General Atomic Company) and Kernforschungsanlage (KFA) TRISO-coated particle stress model. The model enables pressure vessel performance to be predicted for two separate failure modes: Category I, which applies to standard particles characterized by a load-bearing silicon carbide (SiC) layer and instantaneous pyrolytic carbon (PyC) and SiC failure, and Category II, which applies to particles with a defective SIC layer incapable of supporting a tensile load. The revised formalism is based on closed-form stress solutions for the PyC and SiC coating layers that accurately model mechanistic behavior. The model is adaptable to Monte Carlo routines for defining the cumulative PyC and SiC stress distributions for a large number ($10^4$ to $10^6$) particles. The accuracy of the model, based on an uncertainty analysis of input parameters, is within an order of magnitude of the predicted value.

2245 **(GA-A—16982) Fuel performance models for high-temperature gas-cooled reactor core design.** Stansfield, O.M.; Simon, W.A.; Baxter, A.M. (GA Technologies, Inc., San Diego, CA (USA)). Sep 1983. Contract AT03-76ET35300. 48p. (CONF-830451—26). NTIS, PC A03/MF A01. Order Number DE84002669.

From American Ceramic Society annual meeting; Chicago, IL, USA (25 Apr 1983).

Mechanistic fuel performance models are used in high-temperature gas-cooled reactor core design and licensing to predict failure and fission product release. Fuel particles manufactured with defective or missing SiC, IPyC, or fuel dispersion in the buffer fail at a level of less than $5 \times 10^{-4}$ fraction. These failed particles primarily release metallic fission products because the OPyC remains intact on 90% of the particles and retains gaseous isotopes. The predicted failure of particles using performance models appears to be conservative relative to operating reactor experience.

2246 **(IAEA-TC—389/6-18) Split-count technique for failed fuel detection and location.** Brightman, F.G.; Szuster, B.J. (International Atomic Energy Agency, Vienna (Austria); UKAEA Headquarters, London). Jun 1982. 34p. (CONF-820653—19). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703776.

From IAEA specialists' meeting on gas-cooled reactor core and high temperature instrumentation; Cumbria, UK (15 Jun 1982).

This paper reviews development of the "split-count" Burst Can Detection technique on the Windscale AGR. Improvements in failed fuel location were achieved by monitoring the proportion of longer-lived noble gas emitted by very small defects. The behaviour of holes in cladding, $10^{-10}$ $m^2$ or even smaller, was studied over long periods. Experience throughout application on WAGR is described, with reference to post-irradiation examination results and to confirmatory experiments using a loop facility.

2247 **(IAEA-TC—389/6-19) Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry.** Hargreaves, R.; Perrott, E.H. (International Atomic Energy Agency, Vienna (Austria); UKAEA Headquarters, London). Jun 1982. 13p. (CONF-820653—21). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703789.

From IAEA specialists' meeting on gas-cooled reactor core and high temperature instrumentation; Cumbria, UK (15 Jun 1982).

The on-line $\gamma$ spectrometer and associated equipment which was used from 1977 to analyse the radio-active fission products in the WAGR coolant is briefly described. Examples of the measurements obtained are provided, together with their theoretical interpretation. In particular, the effect of pin failure mode on the emissions is considered and a technique is described for deducing the quantity of radio-iodine released at the time of failure from measurement of the xenon daughters.

2248 **(IAEA-TC—389/6-23) Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB.** Hiorns, D.S.; Stallard, M.D. (International Atomic Energy Agency, Vienna (Austria)). Jun 1982. 13p. (CONF-820653—22). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703799.

From IAEA specialists' meeting on gas-cooled reactor core and high temperature instrumentation; Cumbria, UK (15 Jun 1982).

Humidity measurements on nuclear reactor coolant gases are required for many reasons, for instance to detect and locate water leakages from the boilers and to monitor the chemical composition of the coolant for normal operation and during commissioning and maintenance, and the assessment of the performance of driers. For leak detection sensitivity and rapid response are important whereas for routine monitoring drift may be a prime criterion. Some coolants include methane for chemical control that decomposes to water so the levels of moisture that normally exist in the coolant vary with reactor types. No one measurement technique or hygrometer system currently available can be expected to meet all these requirements and in the CEGB it has proved necessary to concentrate on finding a solution to each separately. This paper reviews CEGB experience with numerous hygrometer systems that have been used on both Magnox and AGR coolant gases and highlights some of the problems that have arisen. New development work in the important and demanding area of boiler leak detection and location is also included where a number of new approaches are being investigated, including:- (i) An improved 'first-up' system based on coulometric moisture analysers. (ii) A differential system based on the piezo-electric hygrometer. (iii) A microprocessor controlled system using capacitance probes. Whilst work on the development of new instruments and the design of approved systems is proceeding at different locations within the CEGB it is being reported, together with the latest operational experiences, through the CEGB Chemical Measuring Instruments Advisory Group, on whose behalf this paper is presented.

2249 **(INIS-mf—8403) HKG business report 1981.** (Hochtemperatur-Kernkraftwerk G.m.b.H. (HKG), Uentrop (Germany, F.R.)). May 1982. 27p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703321.

A description of the structure and activities of this common European enterprise is given, which also served as information basis for the ordinary associates' meeting on July 21st, 1982. According to the managers' report the balance and account of profit and loss will be presented by December 31st, 1981. The matter of the enterprise is the planning, financing, construction and operation of a 300 MW high temperature nuclear power station in Hamm-Uentrop as joint power station of the associates.

2250 **(JAERI—1279) SONATINA-2V: a computer program for seismic analysis of the two-dimensional vertical slice HTGR core.** Ikushima, Takeshi. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 67p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703820.

A computer program SONATINA-2V has been developed for predicting the behavior of a two-dimensional vertical slice HTGR core under seismic excitation. SONATINA-2V is a general two-dimensional computer program capable of analyzing the vertical slice HTGR core with the permanent side reflector blocks and its restraint structures. In the analytical model, each block is treated as rigid body and is restrained by dowel pins which restrict relative horizontal movement but allow vertical and rocking motions between upper and lower blocks. Coulomb friction is taken into account between blocks and between dowel pin and hole. A spring dashpot model is used for the collision process between adjacent blocks. The core support structure is represented by a single block. The computer program SONATINA-2V is capable of analyzing the core behavior for an excitation input applied simultaneously to

both vertical and horizontal directions. Analytical results obtained from SONATINA-2V are compared with experimental results and are found to be in good agreement. The computer program can thus be used to predict with a good accuracy the behavior of the HTGR core under seismic excitation. In the present report are given, the theoretical formulation of the analytical model, a user's manual to describe the input and output format, and sample problems.

2251 **(JAERI-M—82-043) System design considerations on the cooling system of the experimental multi-purpose very high temperature gas cooled reactor.** Tadokoro, Yoshihiro; Suzuki, Katsuo; Seya, Toko; Ezaki, Masahiro. (Japan Atomic Energy Research Inst., Tokyo). May 1982. 48p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703777.

This paper describes the results of studying on system problems in the cooling system of the First Conceptual Design. For normal operation, advanced cooling system proposals have been offered, which are capable of controlling the secondary hot-leg helium temperature increase owing to the margin of the heat transfer surface of intermediate heat exchangers and steam generators. As a result of comprehensively evaluating the proposals from the viewpoints of performance, economy, and safety, it was found with the cooling system that the method for adding by-pass nozzle to the steam generator has been evaluated as the best. For accidental conditions, temperature performance analysis has been undertaken in relation to components thermal shock generated by changing-over the primary cooling system to the auxiliary cooling system, and it became evident that the component in a state of sudden temperature changes is a mixer of single-wall pipe. However, it was shown from the results of structural stress analysis that stress generated in the mixer of single-wall pipe is allowable enough. Progressed two adjustments as described above, the cooling system has been established, which satisfied cooling function required to meet the normal operation and the accidental conditions.

2252 **(Juel—1841) Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor.** Banaschek, J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Technische Hochschule Aachen (Germany, F.R.)). Apr 1983. 107p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751358.

This report describes the computation models and methods used in a new developed computer code for the analysis of the dynamic behavior of nuclear power plants with High Temperature Gas Cooled Reactor. The subprograms which have been united to an integrated code are described in detail. The field of application of this code reaches from investigations on transients under normal operation to the thorough description of the load laid on the plant under extreme accidental conditions. The application of the code is shown in two sample cases. The investigations are done for a controlled variation in load of the THTR-300 MWsub(e) power station and the behavior of a 200 MJ/s process-steam-plant in case of a failure of active after-heat-removal.

2253 **Irradiation performance of LEU fuel particle designs.** Kania, M.J.; Homan, F.J. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 214-216(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2254 **Recent developments in graphite for HTGR applications.** Eatherly, W.P.; Engle, G.B. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 216-217(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2255 **Oxidation-related strength loss in HTGR graphites.** Lee, B.S.; Heiser, J.H. III; Sastre, C.; Schweitzer, D.G. (Brookhaven National Laboratory, Upton, NY 11973). *Transactions of the American Nuclear Society;* **44**: 217-218(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2256 **Materials selection for advanced-HTGR component development.** Johnson, W.R.; Roberts, D.I. (GA Technologies, P.O. Box 81608, San Diego, CA 92138). *Transactions of the American Nuclear Society;* **44**: 218-219(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2257 **The kinetics of high-temperature carburization in HTGR atmospheres.** Stubbins, J.F.; Lee, D.K. (University of Illinois, Urbana, IL 61801). *Transactions of the American Nuclear Society;* **44**: 219(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2258 **Transient failure prediction for carbide TREAT test HC-3.** Liu, Y.Y.; Tsai, H.C. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 249-250(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2259 **Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow.** Taylor, G.W.; Dowdy, E.J.; Bieri, J.M. (Los Alamos National Lab., NM). *Analytica Chimica Acta;* **136**: 277-284(1982).

The He($2^3$s) afterglow technique for the determination of trace impurities in helium utilizes the bimolecular, energy-transfer reactions of electronically metastable atoms with impurities and spectroscopic detection of the resulting emissions from molecules and transient fragments. The method has been successfully applied to the monitoring of $H_2O$, $CO_2$, CO, $CH_4$, $N_2$, and $O_2$ in the helium coolant of the high-temperature gas-cooled reactor (HTGR). The lower detection limits for these impurities are in the 0.1 to 10 ppM (cc $m^{-3}$) range using only photomultiplier tube current measurements, with a dynamic range of detection of 2 to 4 orders of magnitude, depending on the impurity. The apparatus, operating parameters, and methods of calibration are discussed. 6 figures, 3 tables.

## 2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

*REFER ALSO TO CITATION(S) 2205, 2301, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2426, 2427*

2260 **(FEI—1340) Method for calculating the temperature field in the fast reactor fuel assembly with random distribution of parameters by the Monte Carlo method.** Bogoslovskaya, G.P.; Zhukov, A.V.; Poplavskij, V.M.; Sorokin, A.P.; Tikhomirov, B.B.; Ushakov, P.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703779.

A statistical model of a fuel element cluster considering the laws of channel flow section distribution obtained in experiments at the BN-600 reactor fuel assembly mock-up is suggested. Technique for calculating the fuel assembly temperature field based on the sequential calculation of a set of fuel assembly versions taking into account the interchannel heat and mass transfer is described. Variants of channel flow section distribution formed by fuel elements are realized using the Monte-Carlo method according to the given function of channel flow section probability density. As a result of the calculations statistical distributions of temperature increase in channels without account for the interchannel heat and mass transfer and with it are obtained. The effect of interchannel transfer on the reduction of maximum nonuniformity in coolant temperature increase caused by dispersion of channel flow sections is shown. The conclusion is made that if heat and mass transfer is not taken into account the value of coolant temperature increase in separate channels coincides with limited value obtained by the dispersion method.

2261 (IAEA-SR—72, pp 1-47) **Canadian development program for off-gas management in nuclear facilities.** Sridhar, T.S. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/5).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The Canadian program for the development and evaluation of processes and technology for the separation and containment of radioactive species in off-gases is directed towards the following specific aspects: 1) assessment of available treatment technology and evaluation of future clean-up requirements; 2) development and engineering evaluation, under realistic conditions, of promising new processes that would be inherently simpler and safer; and 3) specification of off-gas emission control systems for future nuclear facilities based on the most favourable technology. The program is being carried out by Atomic Energy of Canada Limited in collaboration with the electrical utility, Ontario Hydro, and selected Canadian universities. A brief description is presented of methods for removing tritium and carbon-14 from the moderator systems of CANDU power reactors, methods for removing iodine from the off-gases of a molybdenum-99 production facility at the Chalk River Nuclear Laboratories, and procedures for monitoring the off-gas effluent composition in the Thorium Fuel Reprocessing Experiment (TFRE) facility at the Whiteshell Nuclear Research Establishment.

2262 (INIS-mf—8473, pp 193-198) **Analysis of human error trends at the Pickering A nuclear generating station.** Rosehart, R.G.; Doran, T.C.; Randall, G. (Lakehead Univ., Thunder Bay, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

By studying the operating records from the Pickering A Candu reactor installation, an attempt was made to investigate the human errors that have taken place. While investigating these human errors particular attention was given to determining who was responsible for causing these events, why they were caused and the relevant frequency of these occurrences. The material for this study consisted of all the Significant Event Reports (SER's) and Unusual Occurrence Reports (UOR'S) prepared by Ontario Hydro for internal use from January 18, 1970 to July 21, 1979 (excluding those reports that were unavailable due to security reasons). Of the 1374 reports filed during this period, 550 were attributed to human error in that human perception, decision making or forgetting was involved. Reports involving human error were then further classified into 15 categories under four main sections as follows: I - operator error, 45.7 percent; II - maintenance error, 23.3 percent; III - administrative error, 28.7 percent; and IV - installation error, 2.3 percent.

2263 (INIS-mf—8473, pp 1-8) **Dynamic flux synthesis with discontinuous trial functions.** Dastur, A.R.; McCormick, T.R. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A method has been developed that allows the use of precalculated dynamic flux shapes as trial functions for the solution of the space-dependent kinetics equation. The basis of the method is that, for the type of transients encountered in CANDU design and safety analysis, the delayed neutron source that arises from precursors that are formed during the transient has a negligible effect on the shaping of the dynamic flux. This allows a single set of available flux shapes to be used in solving a wide variety of problems. The accuracy of the method is demonstrated by a comparison with finite difference solutions.

2264 (INIS-mf—8473, pp 16-28) **Simulation of Darlington fuelling with SIMODEX, a fuel management program based on modal expansion method.** Wight, A.L.; Wiebe, P. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The simulation of reactor operation using a three dimensional finite difference code such as SORO or FMDP/OHRFSP is quite expensive, even when fairly long time steps are used. There is a need for a fuel management tool which will give approximate power distributions at much lower cost. Modal methods allow inexpensive calculation of flux distributions. In this method the flux distribution is approximated as the sum of a series of 'modes'. A fuel management program, SIMODEX, has been developed to use modal methods for the flux calculation. The program has been validated by simulating a short period of burnup and fuelling of the Darlington A reactor both with SIMODEX and with the finite difference flux calculation (SIMULATE). Comparison of SIMODEX and SIMULATE after the first 10 day burn step gave excellent agreement. Simulation of fuelling was continued using manual selection of channels up to 100 full power days. At this point another flux calculation was done with SIMULATE. Agreement at this point was not as good as at 10 days. Recomputing the modal matrices, however, improved the results.

2265 (INIS-mf—8473, pp 214-220) **600 MW steam generator repair program. Hydraulically expanded tube to tubesheet joints.** Scott, D.A.; Wolgemuth, G.A.; Aiken, J.A. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

To avoid stress corrosion cracking, a method of producing tube to tubesheet joints with low residual stresses was sought. Hydraulic expansion was found be be an acceptable method. In this paper, the experimental and theoretical work done to determine these stresses is presented. The area of interest is the transition region between the expanded and unexpanded sections of tubing. X-ray diffraction, stress corrosion cracking tests and strain gauging were the prime measuring techniques used. Extensive use of finite element analysis was also made. In addition, the pull strength, length change, etc., of this type of joint were investigated.

2266 (INIS-mf—8473, pp 29-35) **Simulation of fuelling operations for CANDU-type reactors.** Lin, Sheng-Chi; Chou, Chan-Shan (Institute of Nuclear Energy Research, Taiwan). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The approach for the fuelling simulation of CANDU-type reactors is presented in this work. The treatment of nuclear data for fuel bundles as well as for control rods, and the establishment of fuelling scheme are described. Results from the simulation program THRFL are compared with published values, and are reasonable in accuracy.

2267 (INIS-mf—8473, pp 36-41) **High order method in flux mapping.** Chan, P.S.W. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

In flux mapping, the neutron flux distribution in a reactor core is synthesized by a linear combination of flux modes whose amplitudes are determined by a least-squares approximation to the measured flux values at flux detector sites. Consequently, there are inherent errors in the synthesized fluxes. This paper describes a high order method that uses the mapping errors at the flux detector sites in conjunction with a set of error modes to deduce the map-

ping errors at other locations in the reactor and subsequently generates an improved flux map. The improvement is shown to be dependent on the quality of the flux detector signals.

2268 (INIS-mf—8473, pp 80-86) **Improvement of the CANDU power cycle by moderator heat recovery.** Todorovski, S.; Hemmings, R.L. (Canatom Ltd., Montreal, Quebec (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

In CANDU reactors, 4.5-5% of the total fission power is transferred to the heavy water moderator in the form of heat. To avoid temperature build-up, this heat is continuously removed by circulating the moderator through the moderator heat exchangers. This paper analyses the possibility of recovery of moderator heat in the process of condensate heating.

2269 (INIS-mf—8473, pp 133-139) **Burnup improvement through reshuffling of fuel bundles of the first fuel change in CANDU-600.** Jenkins, D.; Presley, J.; Augustine, M. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This paper presents several fuelling strategies which can be used to increase the burnup obtained from the first fuel charge (first core load extracted) in the CANDU-PHW 600 MW(e) reactor. The fuelling schemes studied involve reshuffling the end bundles extracted from a channel on its first refuelling. Refuelling with various combinations of reshuffled end bundles and fresh fuel were tried. Each scheme was compared to the once through eight-bundle-shift bi-directional scheme which is the reference scheme at equilibrium burnup conditions. The comparison was made using a coarse mesh reactor model. For each fuelling scheme, reactor operation was simulated from zero FPD (Full Power Days) until one core load was extracted (usually around 350 FPD). The results show that it is possible to increase the average discharge burnup of the first charge by 11% whilst at the same time reducing the average fuelling machine visit rate by 8%. This increased discharge burnup results in a reduction of fuel consumption by about 500 bundles, which roughly corresponds to a saving of 1.5 million dollars.

2270 (INIS-mf—8473, pp 210-213) **In-situ rebuild of the Gentilly 2 steam generators.** Saheb, E. (Hydro-Quebec, Montreal (Canada)); Dahlin, E. (Babcock and Wilcox Canada Ltd., Toronto, Ontario). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The damage in the tube bundles of the four steam generators installed at Gentilly 2 which occurred during the furnace heat-treatment of the completed assembly in the shop, necessitated the complete replacement of these bundles. The decision to replace these bundles in-situ required the development of new design and fabrication methods to solve this first-of-a-kind problem. An overview of the constraints of this rebuild program, the methods used and the results obtained are presented.

2271 (INIS-mf—8473, pp 221-229) **Remotely controlled repairs at Douglas Point NGS.** Broad, L. (Atomic Energy of Canada Ltd., Ottawa, Ontario); McKee, B. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

In September, 1977, leakage of heavy water at a rate of 125 kg/hr was detected in an area of the Douglas Point NGS reactor vault below the calandria known as the lower labyrinth. Radiation in the area ranges up to 5000 R/hr and the only ready access was through four 75 mm inspection ports that open into the moderator room. Remote-controlled equipment was designed and built to diagnose the problems and carry out repairs. All damaged piping was fixed, supports were replaced as needed, and system vibration was reduced. The work was done with no injuries and little radiation dose.

2272 (INIS-mf—8473, pp 230-236) **Example of remote maintenance in high radiation fields.** Pothier, N.E.; Brisbois, L.U. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Six auxiliary low pressure small (diameter $<=5.0$ cm) pipes located inside the reactor vault of the Douglas Point Nuclear Generating Station failed due to fretting wear at U-bolt supports: two had worn through the wall and developed leaks, and the others had worn $<=$ 50% through the pipe wall. Human entry into the vault was not possible because of high radiation fields; hence, hands-on repair was not possible. The pipes were repaired and resupported to prevent further fretting wear failures during February-September, 1980. The repair work was performed using custom designed and developed remotely operated tooling and closed-circuit TV viewing. Three main groups were involved in the repair work: Atomic Energy of Canada Engineering Company (AECEC) - the reactor owner; Ontario Hydro - the reactor operator; and, Chalk River Nuclear Laboratories (CRNL). In this report, the contributions made by CRNL are summarized and discussed.

2273 (INIS-mf—8473, pp 123-125) **Neutron cost criteria for long-term fissile fuel enhancement.** Harms, A.A. (McMaster Univ., Hamilton, Ontario (Canada). Dept. of Engineering Physics). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The ready availability of neutrons from non-thermal-fission sources could aid both the front-end and back-end of the nuclear fuel cycle in providing new options and strategies. These considerations served to establish the fast-breeder program, are central to the development of spallation accelerators, and represent one motivation for the fusion-fission hybrid. The potential benefit from the availability of 'exogenous neutrons' can evidently have its most significant impact with neutron efficient reactors such as CANDU.

2274 (INIS-mf—8473, pp 199-203) **Process of designing effective training courses and programs.** Birse, R.D. (Ontario Hydro, Rolphton (Canada). Nuclear Training Centre). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Effective training courses are those which increase the capability of the employee to perform the job. The Nuclear Generation Division of Ontario Hydro has adopted a process of job and task analysis to arrive at effective training courses.

2275 **(PNC-N—343-82-01) Role of Fugen HWR in Japan and design of a 600 MWe demonstration reactor.** Sawai, Sadamu. (Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). Mar 1982. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703778.

Fugen, a 165 MWe prototype of a heavy water-moderated, boiling light water-cooled reactor, has been in commercial operation since March 20, 1979. In parallel with the Fugen project, the design work for a 600 MWe demonstration plant has been carried out since 1973. The important systems and components, such as pressure tube assemblies and control rod drive mechanism, are essentially the same as those of Fugen. However, some modification is made owing to the experience obtained in Fugen and LWrs. In the HWR Fugen, plutonium and uranium are effectively used, and plutonium makes the coolant void reactivity more negative, which results in the increase of the stability and safety of the reactor. On

August 4, 1981, the ad hoc committee submitted the final report to the Japanese Atomic Energy Commission, in which the construction of a 600 MWe demonstration plant was recommended. As for the research and development on reactor safety, coolant leak detectors, the performance of ECCS, and safety design codes are enumerated. Since 1965, mixed oxide fuel has been developed, and 168 fuel assemblies were loaded in Fugen, but failure did not occur.

2276 **Operational and economic aspects of CANDU fuel cycles.** James, R.A. (Ontario Hydro, 700 University Avenue, Toronto, Ontario M5G 1X6). *Transactions of the American Nuclear Society;* **44**: 106-107(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2277 **Reactivity monitoring during reactor reloading operations.** Baumann, N.P.; Ahlfeld, C.E.; Ridgely, G.C. (E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, SC 29808). *Transactions of the American Nuclear Society;* **44**: 288-289(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2278 **Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors.** Causey, A.R.; Holt, R.A. (Atomic Energy of Canada Limited, Chalk River Nuclear Laboratories, Chalk River, Ontario K0J 1J0). *Transactions of the American Nuclear Society;* **44**: 235-237(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2279 **Maintenance in a nuclear power station as an indicator of technological transfer: Atucha-1 experience.** Rapoport, H.; Eppenstein, P. (CNEA/Argentina, Comision Nacional de Energia Atomica, Av. Del Libertador 8250, 1429, Buenos Aires). *Transactions of the American Nuclear Society;* **42**: 125-126(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

## 2105 Power Reactors, Breeding

*REFER ALSO TO CITATION(S) 1994, 2267, 2400, 2407, 2436, 2437, 2461, 2462, 2463, 2464, 2498, 2502, 2507, 2721*

2280 **(CEA-CONF—6657) Survey of C.E.A. absorber materials development program.** Colin, M.; Brie, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Apr 1983. 9p. (CONF-8304124—7). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704306.

From Specialist meeting on absorbing pins and materials; San Francisco, CA, USA (11 Apr 1983).

The development on absorber materials is summarized including in-pile tests in PHENIX reactor, the out-pile studies, the post-irradiation examination program and further studies such as synthesis and modelling.

2281 **(CONF-831111—10) Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes.** Efferding, L.E. (Westinghouse Electric Corp., Pensacola, FL (USA). Nuclear Components Div.). 1983. Contract AC02-77ET37201. 8p. NTIS, PC A02/MF A01. Order Number DE84002738.

From ASME winter annual meeting; Boston, MA, USA (13 Nov 1983).

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Experimental results are described of a test program which induced water/steam dynamic instability in the multiple tube circuits of a sodium heated, double-wall tube, steam generator model whose water/steam side is designed to operate under once-through conditions with exit superheat (457°C/855°F; 15.8 MPa/2290 psia). The instability thresholds were determined experimentally with off-nominal operation in order to establish the stability margin that exists with and without the damping orifice configuration employed at the inlet of each tube circuit. Two classes of experiments were performed; one with low magnitudes of water/steam mass velocity resulting in high exit superheat (Benson Cycle), and the other with high magnitudes of mass velocity and no bulk exit steam superheat (Sulzer Cycle). Analytical prediction of the instability inception conditions were compared with experiment and are included along with an evaluation of the applicability of the analysis method to plant scale stability evaluations.

2282 **(CONF-8310102—2) Wide-range vortex shedding flowmeter for high-temperature helium gas.** Baker, S.P.; Herndon, P.G.; Ennis, R.M. Jr. (Oak Ridge National Lab., TN (USA); American Magnetics, Inc., Oak Ridge, TN). 1983. Contract W-7405-ENG-26. 38p. NTIS, PC A03/MF A01. Order Number DE84001984.

From Instrument Society of America conference and exhibit; Houston, TX, USA (10 Oct 1983).

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The existing design of a commercially available vortex shedding flowmeter (VSFM) was modified and optimized to produce three 4-in. and one 6-in. high-performance VSFMs for measuring helium flow in a gas-cooled fast reactor (GCFR) test loop. The project was undertaken because of the significant economic and performance advantages to be realized by using a single flowmeter capable of covering the 166:1 flow range (at 350°C and 45:1 pressure range) of the tests. A detailed calibration in air and helium at the Colorado Engineering Experiment Station showed an accuracy of +-1% of reading for a 100:1 helium flow range and +-1.75% of reading for a 288:1 flow range in both helium and air. At an extended gas temperature of 450°C, water cooling was necessary for reliable flowmeter operation.

2283 **(FRNC-TH—1151) Contribution to the study of the thermal interaction between uranium oxide and sodium.** Newman, W.H. (Grenoble-1 Univ., 38 (France); Institut National Polytechnique, 38 - Grenoble (France)). 1982. 212p. (In French). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83704397.

A description is given of the experimental results of the fuel-coolant interactions carried out in the CORECT II device at the Grenoble Nuclear Study Centre. A description is then given of a theoretical model of interaction which comprises three points: first a study of the coolant, that is to say of its hydrodynamic and thermodynamic behaviour, then the study of the fuel, namely the phenomena of fragmentation and heat transfer between the fuel and the coolant, and last the treatment of heat leaks to the structures. A study follows on the effect of the various parameters on the theoretical model as well as the effects of the assumptions on the fragmentation, transfer and losses of heat. Last, the interpretations of a few experiments carried out with two models of fragmentation are described. A discussion of these interpretations enables some generalizations to be made on the nature of the thermal interaction.

2284 **(FRNC-TH—1152) Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants.** Lestrat, P. (Poitiers Univ., 86 (France)). Nov 1982. 162p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83704404.

This study aims to analyze and explain the structure of a reactive jet of water steam in liquid sodium, as from a ligh pressure tank and an orifice of very small section. The prior understanding of this reactive jet makes it possible to explain certain results of erosion-corrosion (wastage) that can occur in the steam generators of breeder reactor power stations. This study gave rise to an experimental simulation (plane jet of water steam on a bed of sodium), as well as to suggesting a reactive jet model according to the principle of an "immersed Na-$H_2O$ diffusion flame".

2285 **(HEDL-SA—2786) In-reactor creep behavior of selected ferritic alloys.** Puigh, R.J.; Wire, G.L. (Westinghouse Hanford Co., Richland, WA (USA); IIT Research Inst., Chicago, IL (USA)). 1983. Contract AC06-76FF02170. 24p. (CONF-830659—13). NTIS, PC A02/MF A01. Order Number DE83017005.

From TMS/AIME topical conference on ferritic alloys for use in nuclear energy technologies; Snowbird, UT, USA (19 Jun 1983).

An experiment was conducted in the Experimental Breeder Reactor-II (EBR-II) to investigate the in-reactor creep behavior of selected ferritic alloys. Pressurized tube creep specimens fabricated from the following ferritic alloys: HT-9, 9Cr-2Mo, and 2-1/4Cr-1Mo, were irradiated in EBR-II to a peak fluence of 2.8 x $10^{22}$ n/cm$^2$ (E > 0.1 MeV) and at irradiation temperatures of 443, 505 and 572°C. Each alloy had four specimens with midwall hoop stresses of 0, 50, 75 and 100 MPa at each irradiation temperature. Measurements of the zero-stressed specimens indicate that none of the ferritic alloys are exhibiting evidence for swelling or phase transformations at these irradiation temperatures and at a fluence of 2.8 x $10^{22}$ n/cm$^2$ (E > 0.1 MeV).

2286 **(KAPL—4154) Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program).** Merriman, F.C.; McCoy, D.F.; Boyd, W.A.; Dwyer, J.R. (Knolls Atomic Power Lab., Schenectady, NY (USA)). May 1983. Contract AC12-76SN00052. 80p. NTIS, PC A05/MF A01. Order Number DE84002479.

Light water prebreeder/breeder conceptual reactor systems have been developed which have the potential to significantly improve the fuel utilization of present generation light water reactors. The purpose of this study is to describe and compare two possible types of thorium fuel cycles for use in these light water prebreeder and breeder concepts. The two types of thorium fuel cycles basically differ in the fuel rod design used in the prebreeder cores and the uranium isotopic concentration of fuel supplied to the breeder cores.

2287 **(KAPL—4158) Core subchannel thermal-hydraulic analysis methods and critical heat-flux margin in a light-water breeder reactor.** Misiewicz, R.; Kast, S.J.; Wunderlich, L.H. (Knolls Atomic Power Lab., Schenectady, NY (USA)). May 1983. Contract AC12-76SN00052. 124p. NTIS, PC A06/MF A01. Order Number DE84000818.

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Analyis methods and results are described for critical heat flux (CHF) performance margin in the core of an advanced light water moderated breeder reactor design concept. The 1000 MWe breeder reactor is basically like a large commercial pressurized water reactor (PWR); however, a number of core design features require special consideration with regard to predicting margin to CHF design limits. Three notable features are: (1) fuel rods closely spaced in a triangular pitch lattice; (2) high power seed fuel regions adjacent to low power blanket regions in an open lattice; and (3) power producing thoria shim rods enclosed in individual guide tubes. CHF performance of the breeder core was analyzed with the HOTROD and COBRA computer codes.

2288 **(ORNL—5986) Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor.** Walker, R.L.; Botts, J.L.; Cooper, J.H.; Adair, H.L.; Bigelow, J.E.; Raman, S. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 61p. NTIS, PC A04/MF A01. Order Number DE84002266.

The United States and the United Kingdom are engaged in a joint research program in which samples of the higher actinides are irradiated in the Dounreay Prototype Fast Reactor in Scotland. The purpose of the porogram is (1) to study the materials behavior of selected higher actinide fuels and (2) to determine the integral cross sections of a wide variety of the higher actinide isotopes. Samples of the actinides are incorporated in fuel pins inserted in the core. For the fuel study, the actinides selected are $^{241}$Am and $^{244}$Cm in the form of $Am_2O_3$, $Cm_2O_3$, and $Am_8Cm(RE)_7O_{21}$, where (RE) represents a mixture of lanthanides. For the cross-section determinations, the samples are milligram quantities of actinide oxides of $^{248}$Cm, $^{246}$Cm, $^{244}$Cm, $^{243}$Cm, $^{243}$Am, $^{241}$Am, $^{244}$Pu, $^{242}$Pu, $^{241}$Pu, $^{240}$Pu, $^{239}$Pu, $^{238}$Pu, $^{237}$Np, $^{238}$U, $^{236}$U, $^{235}$U, $^{234}$U, $^{233}$U, $^{232}$Th, $^{230}$Th, and $^{231}$Pa encapsulated in vanadium. Coincident with the irradiations, neutron flux and energy spectral measurements are made with vanadium-encapsulated dosimeter materials located within the same fuel pins.

2289 **Fuel pin cladding transient failure strain criterion.** Bard, F.E.; Duncan, D.R.; Hunter, C.W. (Westinghouse Electric Corporation, Hanford Engineering Development Laboratory, P.O. Box 1970, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 246-247(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2290 **Experience with FBR education in laboratory and short course settings.** Waltar, A.E. (Westinghouse Electric Corporation, Hanford Engineering Development Laboratory, P.O. Box 1970, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 44-46(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2291 **A responsive and effective breeder reactor engineering curriculum.** Vernet, W.G. (University of Florida, Gainesville, FL 32611). *Transactions of the American Nuclear Society;* **44**: 46-47(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2292 **Experience with breeder reactor courses at the University of Virginia.** Reynolds, A.B. (University of Virginia, Charlottesville, VA 22901). *Transactions of the American Nuclear Society;* **44**: 47-48(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2293 **Breeder reactor engineering education at the University of Arizona.** Ganapol, B.D. (University of Arizona, Tucson, AZ 85721). *Transactions of the American Nuclear Society;* **44**: 48-49(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2294 **Environmental effects of the Clinch River Breeder Reactor fuel cycle.** Lowenberg, H. (U.S. Nuclear Regulatory Commission, Washington, DC 20555). *Transactions of the American Nuclear Society;* **44**: 93-95(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2295 **A spent fuel storage system for LMFBR fuel experiments.** Seay, J.M.; Gruber, W.J. (Westinghouse Electric Corporation, Hanford Engineering Development Laboratory, P.O. Box 1970, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 122-123(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2296 **LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations.** Kramer, J.M.; DiMelfi, R.J. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 244-246(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2297 **Development of stress-based transient cladding damage correlations and fuel pin breach criteria.** Biancheria, A.; Brizes, W.F.; Gneiting, B.C. (Westinghouse Electric Corporation, Advanced Reactors Division, P.O. Box 158, Madison, PA 15663). *Transactions of the American Nuclear Society;* **44**: 247-248(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2298 **Application of experimental data to the estimation of fuel pin failure probability.** Harbourne, B.L.; Stephen, J.D.; Tatsumi, J.T. (General Electric Company, 310 DeGuigne Drive, P.O. Box 5020, Sunnyvale, CA 94036). *Transactions of the American Nuclear Society;* **44**: 248(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2299 **Performance of high plutonium weight fraction mixed-oxide fuel.** Lawrence, L.A. *Transactions of the American Nuclear Society;* **44**: 256-257(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2300 **Basic analyses and a comparison of the characteristics of the GCFR and the LMFBR with the thorium cycle in one - group diffusion theory.** Sabundjian, G. Sao Paulo, Brazil; Instituto de Pesquises Energetices e Nucleares (1981). 225p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

A preliminary study of neutronics characteristics of thorium cycle fast breeder reactors has been done using simplified reactor models and analyses methods with the aim of finding a type of breeder reactor suitable for an efficient utilization of thorium that is abundant in Brazil. Basic methods of cross section processing and reactor calculation are studied and applied to analyze breeding characteristics of GCFRs and LMFBRs. The GCFR is fueled with oxide pins and cooled with helium. The LMFBR is fueled with thin metallic pins to achieve high power densities. Neutronics characteristics are determined as functions of the average power density and the fuel volume fraction. Results show that a high power density and a high fuel volume fraction are desirable to achieve short doubling times, that the GCFR is inferior to the LMFBR in regard to the doubling time and that the LMFBR can achieve reactor doubling times ten years with an average power density of - 600MW/$m^3$ and a fuel volume fraction of 40%.

2301 **The TCLUST1 transient LMFBR intersubassembly heat transfer code.** Chang, L.K.; Feldman, E.E. (Argonne National Lab., IL). *Numerical Heat Transfer;* **2**: 373-385(1979). Contract W-31-109-ENG-38.

The TCLUST1 computer code has been developed to study the transient thermal performance of a liquid metal fast breeder reactor (LMFBR) subassembly that is thermally coupled to its six immediate neighbors. Each of the seven subassemblies may be either a reflector subassembly, which contains a single solid hexagonal rod, or a pin-bundle subassembly. The TCLUST1 analytical model, which is based on conservation of energy, and the numerical solution method, which employs successive over-relaxation (SOR), are described. Analytical temperature predictions are compared with data obtained from a natural-convective flow test performed in Experimental Breeder Reactor II. Good agreement is obtained between the analytical and measured results.

2302 **Scoping calculations for design and analysis of large reactor vessels for liquid-metal fast breeder reactor (LMFBR) plants.** Seidensticker, R.W.; Fiala, C.; Kulak, R.F.; Ma, D.C.; Pan, Y.C.; Wang, C.Y.; Zeuch, W.R. (Argonne National Lab., IL). pp 141-154 of Pressure vessel design. PVP-Vol. 57. Widera, G.E.O. (ed.). New York, NY; The American Society of Mechanical Engineers ([nd]).

Reactor vessels for commercial-sized LMFBR plants are quite large--ranging 12-22 m (40-70 ft) in diameter and 15-22 m (50-70 ft) in overall depth. These stainless steel vessels contain liquid sodium at relatively low pressures, but at high temperatures. The resulting thin-walled vessels present the structural designer and analyst with special problems, particularly in providing a balanced design to accommodate seismic loads, design basis accident loads, and thermal loadings. A comprehensive set of scoping calculations made for a conceptual design--though preliminary in detail and depth of design--provides substantial guidance to the vessel designer for subsequent design iterations. Emphasis is placed on the analysis of the large diameter top closure of the vessel--the deck structure.

## 2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

2303 **(INIS-mf—8407) Safety philosophy and licensing practice in different member states of IAEA: Canada.** Boyd, F.C. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 17p. (CONF-8109134—Absts.). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703331.

From International conference on industrial application of radioisotopes and radiation technology; Grenoble, France (28 Sep 1981).

The lecture will provide an outline of the Canadian nuclear organization and basic characteristics of the CANDU reactor as a background for a brief description of the nuclear power plant licensing process and the safety philosophy followed. The regulatory agency (Atomic Energy Control Board) follows a three step licensing procedure, Site Acceptance, Construction Approval, Operating Licence. Defense in depth is followed as a general safety concept, but is applied in a special way. Completely separate and independant safety systems are required and basic criteria established through reference dose limits for any assumed failure (or initiating event) in any process (operating) system and for any such failure combined with complete failure at any safety system. The application of the Canadian approach in other countries will be mentioned.

2304 **Gaseous fuel reactors for power systems.** Helmick, H.H.; Schwenk, F.C. Warrendale, PA; Society of Automotive Engineers, Inc. (1978). 8p.

The Los Alamos Scientific Laboratory is participating in a NASA-sponsored program to demonstrate the feasibility of a gaseous uranium fueled reactor. The work is aimed at acquiring experimental and theoretical information for the design of a prototype plasma core reactor which will test heat removal by optical radiation. The basic goal of this work is for space applications, however, other NASA-sponsored work suggests several attractive applications to help meet earth-bound energy needs. Such potential benefits are: small critical mass, on-site fuel processing, high fuel burnup, low fission fragment inventory in reactor core, high temperature for process heat, optical radiation for photochemistry and space power transmissions, and high temperature for advanced propulsion systems. Low power reactor experiments using uranium hexafluoride gas as fuel demonstrated performance in accordance with reactor physics predictions. The final phase of experimental activity now in progress is the fabrication and testing of a buffer gas vortex confinement system.

## 2107 Regulation And Licensing

*REFER ALSO TO CITATION(S) 2200, 2394, 2468, 2469, 2470, 2471, 2474, 2475, 2476, 2477, 2478, 2479, 2481, 2482, 2483, 2484*

2305 **(INIS-mf—8446) Licensing of nuclear power plants in Brazil.** Lederman, L. . (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1980. 29p. (CONF-8009308—58). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703332.

From IAEA interregional training course on safety analysis; Karlsruhe, F.R. Germany (3 Sep 1980).

In Brazil the governmental organization responsible for the licensing of NPPs is the Comissao Nacional de Energia Nuclear (CNEN), the Brazilian Regulatory Body. A description of CNEN's organization, responsabilities and working methods, as well as the present situation of the Brazilian NPPs undergoing licensing, has recently been presented. In this paper the experience gained by CNEN in the course of licensing Brazilian NPPs Units I and II is discussed. CNEN's present day technical competence and its future trends are analysed with regard to in-house capacity, foreign consultants and research contracts with Brazilian Universities. Finally, the immediate need for a Safety research programm in support of licensing is discussed. Manpower needs and major areas for such a programm are also indicated.

2306 **(INIS-mf—8454) IAEA code and safety guides on licensing.** Andres, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1980. 15p. (CONF-8009308—59). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703333.

From IAEA interregional training course on safety analysis; Karlsruhe, F.R. Germany (3 Sep 1980).

The paper discusses licencing as a regulatory tool and explains the informations to be submitted in support of licensing applications.

2307 (INIS-mf—8473, pp 253-257) **'Exporting' the Canadian licensing program.** Whelan, D.J. (Atomic Energy Control Board, Ottawa, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (INFO—0080).

In Second annual conference, 1981. Proceedings.

This paper deals with the problem of an overseas regulatory agency in licensing a Canadian-supplied nuclear plant that is referenced to a plant in Canada. First the general problems associated with the use of a reference plant are discussed. This is followed by a discussion of specific problems which arise from the licensing practices in Canada. The paper concludes with recommendations to simplify the task of demonstrating the licensability of an overseas CANDU plant.

2308 **(NUREG—0750-Vol.17-No.1) Nuclear Regulatory Commission issuances, January 1983. Vol. 17, No. 1.** (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Technical Information and Document Control). 1983. 74p. NTIS, PC A04/MF A01 - GPO. Order Number DE84900284.

This report includes the issuances received during the specified period from the Commission (CLI), the Atomic Safety and Licensing Appeal Boards (ALAB), the Atomic Safety and Licensing Boards (LBP), the Administrative Law Judge (ALJ), the Directors' Decisions (DD), and the Denials of Petitions for Rulemaking (DPRM).

2309 **(NUREG—0750-Vol.17-No.2) Nuclear Regulatory Commission Issuances, February 1983. Vol. 17, No. 2.** (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Technical Information and Document Control). 1983. 269p. NTIS, PC A12/MF A01 - GPO. Order Number DE84900281.

This report includes the issuances received during the specified period from the Commission (CLI), the Atomic Safety and Licensing Appeal Boards (ALAB), the Atomic Safety and Licensing Boards (LBP), the Administrative Law Judge (ALJ), the Directors' decisions (DD), and the Denials of Petitions for Rulemaking (DPRM).

2310 **(NUREG—1020-Vol.1) GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289).** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Sep 1983. 110p. NTIS, PC A06/MF A01 - GPO $5.00. Order Number DE84900048.

This report documents a review by the Nuclear Regulatory Commission (NRC) staff of the General Public Utilities Corporation, et al. v. the Babcock and Wilcox Company, et al. (GPU v. B and W) lawsuit record to assess whether any of the staff's previous conclusions or their principal bases presented at the Three Mile Island Unit 1 (TMI-1) restart hearing, supporting restart of TMI-1, should be amended in light of the information contained in the lawsuit record. Details of the lawsuit record are provided in the appendices contained in Volume II of this report.

2311 **(NUREG—1020-Vol.2-App.) GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289). Volume 2. Appendices.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Sep 1983. 836p. NTIS, PC A99/MF A01 - GPO $14.00. Order Number DE84900047.

Portions are illegible in microfiche products.

Volume II of the GPU v. B and W lawsuit review contains four appendices supporting the review of the GPU v. B and W lawsuit discussed in Volume I of this report. As outlined in the Background section of Volume I under (3) Review Method Utilized by the Staff, the GPU v. B and W lawsuit review was partitioned into 10 categories. The 154 certification items and the 19 long-term actions (hearing items or restart issues) resulting from Commission Orders and the hearing process were each placed in one or more of the 10 categories. These appendices contain the hearing items by category; lawsuit record by category; category location matrix for lawsuit record; and uncategorized lawsuit record.

2312 **The effect of accidents on decommissioning waste management for nuclear fuel cycle and nonfuel cycle facilities.** Elder, H.K. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 108-109(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2313 **Certification and qualification of suppliers and personnel for the Argentine nuclear program.** Volman de Tanis, S.; Baez, J.N. (CNEA/Argentina, Comision Nacional de Energia Atomica, Av. Del Libertador 8250, 1429, Buenos Aires). *Transactions of the American Nuclear Society;* **42**: 166-167(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2314 **Operating experience with light-water reactors in Switzerland.** Kuffer, K.P. (NOK/Switzerland, Nordostschweizerische Kraftwerk A.G., Nuclear Power Plants, Beznau, CH-5312, Doettingen). *Transactions of the American Nuclear Society;* **42**: 119-120(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

## 2108 Economics

*REFER ALSO TO CITATION(S) 2473*

2315 **(DOE/ET/34072—2) Data Base Management Project. Annual report, 29 September 1982-29 September 1983.** Woodis, A.; Rumble, E. (Science Applications, Inc., Palo Alto, CA (USA)). Oct 1983. Contract AC02-80ET34072. 59p. (SAI—83/1104). NTIS (US Sales Only), PC A04/MF A01. Order Number DE84002326.

The US Department of Energy is sponsoring projects to develop and demonstrate the technology to extend burnup of light water reactor fuels. Data from these projects are being stored in the National Fuel Performance Data Base. A summary of the data currently available from these projects is presented.

2316 **(INIS-mf—8189) Bruce nuclear project.** Rose, J.B. (McMaster Univ., Hamilton, Ontario (Canada)). 1981. 110p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703328.

Canadian Construction Association, Ottawa, Ontario (Canada); Mega projects; The collective bargaining dimension.

This case study assesses the industrial relations impact of the construction of the Bruce Nuclear Power Development. It examines the labour relations system in the Ontario electric power sector and in major building construction. Industrial relations problems and practices at the Bruce project are reviewed. The focus of the study is on the relationship between the project and the rest of the Ontario industrial construction industry.

2317 **(INIS-mf—8431) Overview of the need of manpower supply for a nuclear programme.** Palabrica, R.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 4p. (CONF-8109134—Absts.). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703330.

From International conference on industrial application of radioisotopes and radiation technology; Grenoble, France (28 Sep 1981).

The present paper deals with the need for trained manpower and special features of nuclear power affecting manpower requirements and gives a manpower loading schedule for the different nuclear power activities and programmes for manpower development.

2318 **(INIS-mf—8461) Waste management and the nuclear fuel cycle.** Molinari, J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 59p. (CONF-8209134—4). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703324.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

The present lecture deals with energy needs and nuclear power, the importance of waste and its relative place in the fuel cycle, the games of controversies over nuclear waste in the strategies of energy and finally with missions and functions of the IAEA for privileging the rational approach and facilitating the transfer of technology.

2319 **Overview of a procedure for human reliability analysis.** Bell, B.J.; Swain, A.D. (Sandia National Lab., Albuquerque, NM). pp 1527-1536 of Probabilistic risk assessment. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

A human reliability analysis should be performed as an integral part of a probabilistic risk assessment. The methodology for conducting a human reliability analysis is described fully in NUREG/CR-1278, and a procedure for same in NUREG/CR-2254. This paper presents an overview of the procedure as used in the Interim Reliability Evaluation Program and described in Chapter 4 of the Probabilistic Risk Assessment Procedures Guide.

## 2109 Process Heat Reactors

*REFER ALSO TO CITATION(S) 1902*

2320 **Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant.** Turner, R.F.; Baxter, A.M.; McEachern, D.W.; Neylan, A.J.; Stansfield, O.M. (GA Technologies, P.O. Box 81608, San Diego, CA 92138). *Transactions of the American Nuclear Society;* **44**: 213-214(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2321 **Practical availability analysis of standby systems.** Vaurio, J.K. (Argonne National Lab., IL). *Proceedings, Annual Reliability and Maintainability Symposium;* 125-131(1982).

Comprehensive availability models are developed in this paper for analyzing redundant standby safety systems. The models, which include both periodic inspections and continuous monitoring for discovering failures, incorporate human errors associated with testing, monitoring, and repair as well as spurious alarms and failures after a demand during the mission time. Equations are developed for calculating optimum inspection intervals and average steady state availabilities of standby m-out-of-n:G systems (with several schemes of staggering the tests), as are techniques for including undetected and common-cause failures. Analytical models provide a basis for many generic conclusions. Numerical examples representative of safety systems in nuclear power plants illustrate, for example, the importance of developing monitoring techniques to detect errors made in testing and returning components to service after maintenance.

# 22 NUCLEAR REACTOR TECHNOLOGY

2322 **(RIG—13) Progress report 1979-1981.** Ledinegg, E. (Reaktorinstitut Graz (Austria). Verein zur Foerderung der Anwendung der Kernenergie). Mar 1982. 37p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703837.

The report contains the research activity of the Reactor Institute of Graz from 1979 to 1981. The experimental activity is presented in contributions of plasma-, neutron-, reactor-, and nuclear physics, as well as reactor kinetics and isotope techniques. In addition some applied proceedings of operation and measurement are described, also a view on the activity of the experimental research station for radiation measuring and protecting, authorized by government, is given. Enclosed is an extensive list of appropriate publications.

## 2201 Theory And Calculation

*REFER ALSO TO CITATION(S) 1924*

2323 **(FEI—1336) Averaging of constants in the $B^2$ approximation for reactor calculation.** Shulepin, V.S.; Sharapov, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703763.

Analytical derivation of a formula for determining the effective neutron multiplication factor Ksub(eff) in the $B^2$ approximation using the methods of averaging over neutron spectrum and taking into account the neutron importance is given. Dependence of averaged reactor core constants on the value of the geometric parameter $B^2$ is studied. It is shown that the averaging of reactor core constants when using the $B^2$ approximation doesn't cause the change in Ksub(eff). The averaging of constants over neutron spectrum with neutron importance account for and without it gives the same Ksub(eff) value. The core constants averaged over neutron spectrum de- pend less on $B^2$ value as compared with corresponding values ob- tained with the averaging taking into account the neutron impor- tance value. Considerable dependence of reflector albedo on the me- thod of constant averaging is discovered.

2324 **(FEI—1337) Application of polynomial expansions for calculating neutron transport through spherical regions with cavities.** Bocharova, I.E.; Najdenkova, T.I.; Polivanskij, V.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703764.

A method for numerical solution of a problem on thermal neutron flux distribution in spherically symmetric systems near vacuum gap is described. Problem solution for spherical uranium-water cells in the 2Psub(N) and 4Psub(N) approximations by means of the modified spherical harmonics method is considered. Results of one-velocity problem solution are given as an illustration.

2325 **(IAE—3561/4) Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core.** Blinkin, V.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 32p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703765.

A mathematical model describing neutron thermalization in a heterogeneous cell of the molten salt thermal reactor core (MSR) is formulated. The problem is solved using the heavy gas moderator approximation. The analytical formulas for cross sections of thermal neutron interaction with matter homogenized over the reactor cell are obtained. Reactivity temperature coefficients connected with changes in the thermal neutron cross sections caused by variations in temperature of separate environment components are calculated. It is shown that the value and sign of the temperature coefficients depend considerably on the cell dimensions and nuclear fuel composition. Comparison of the calculational results for the thermal neutron cross sections, thermal neutron utilization factor and reactivity temperature coefficients obtained using the given analytical formulas with the results of numerical calculations according to the NEKTAR and WIMS-D programs shows that the suggested method gives an opportunity to calculate homogenized constants for thermal neutrons in the MSR standard cells with the accuracy not worse than 3-4%. The reactivity temperature coefficients are obtained with the accuracy of 30-40% and their qualitative dependence on cell parameters is described correctly. The conclusion is made that the developed method for calculation of macroscopic constants for thermal neutrons in theMSR core can be used for pre-

liminary studies of the MSR parameters in wide ranges of dimensions and elementary heterogeneous cell compositions.

2326 (INIS-mf—8473, pp 9-15) **Subnoding technique in the context of the analytic nodal method.** Koclas, J. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The problem of getting detailed information in one location of a nuclear reactor core often arises. The usual way in which this situation is treated is simply to increase the number of mesh lines in the area of interest. However, these mesh lines must be extended throughout the rest of the reactor core. This can significantly increase the number of unknowns with which the problem must be analyzed. This situation may be alleviated when the Analytic Nodal Method is used. When it becomes necessary to subdivide a node into smaller portions, the new mesh lines will not have to be extended through the entire core. The local subnoded problem may be coupled to the surrounding environment. Another application of this method is the computation of flux distributions within a node once a coarse mesh solution has been obtained. A few test problems with their results are presented, including a PWR model in two-dimensional geometry.

2327 (INIS-mf—8473, pp 284-289) **Bimodal analysis and spatial control.** Mamourian, M.; Pauksens, J.; Moore, R.F. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A simple bimodal variant of the SMOKIN reactor kinetics model has been developed for the purpose of investigating spatial xenon kinetics effects relevant to reactor spatial control system design. The model has been implemented in a computer program called BIMODEX. A distinctive feature of this program is simplified modelling of reactor operation with and without spatial control. The basic non-linear feature of xenon kinetics is retained.

2328 **(INIS-mf—8555) Comparison of neutron transport calculations with NRC test results. Final report.** Koban, J.; Hofmann, W. (Kraftwerk Union A.G., Erlangen (Germany, F.R.)). Feb 1981. 82p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703593.

For an exactly defined reactor arrangement (PCA = Pool Critical Assembly) neutron fluxes, neutron spectra and reaction rates for several neutron detectors were calculated by means of one and two dimensional transport codes. An international comparison proved the methods applied at KWU to be adequate. There were difficulties, however, in considering the three dimensions of the assembly which result mainly from its small dimension. This fact applies to all participants who didn't use three dimensional codes. (orig.).

2329 **(JAERI-M—82-072) TIMS-PGG: a code system for producing group constants in fast neutron energy region.** Takano, Hideki; Hasegawa, Akira; Kaneko, Kunio. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 109p. (In Japanese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703821.

The TIMS-PGG code system has been developed for calculating group constants in fast neutron energy region by processing the nuclear data files compiled with the ENDF/B-IV format. In this code system, the group constant for light and medium weight nuclei and for the smooth cross sections of heavy nuclei are calculated by weighting either "1/E and fission spectra" or "collision density spectrum", using the PROF.GROUCH.GIIR/code. For resonant nuclei, the TIMS-1 code which solves exactly the neutron slowing down equation is used. The calculated infinitely dilute cross sections, resonance shielding factors, scattering transfer matrices and fission spectra are weitten to "Master file" with the PDS format. From the Master file, depending on user's object, a user library is produced by using the utility code LIBMAKE. The present report describes the user's manual of the TIMS-PGG code system and the generation method of group constants library. Moreover, the user's manual of the code is described for fast reactor benchmark tests.

2330 **Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'".** Smith, K.S. (Argonne National Laboratory, P.O. Box 2528, Idaho Falls, Idaho 83401). *Nuclear Science and Engineering;* **84**: No. 1, 74(May 1983).

The primary thrust of the original article was to establish the magnitude of the errors that are introduced when flux-weighted cross sections are used to compute sample reactivities. Suggests that the reasons for which the particular method of correcting for adjoint flux heterogeneities was chosen are in part due to the particular methods by which sample reactivities are measured.

2331 **Solving the uncommon nuclear reactor core neutronics problems.** Vondy, D.R.; Fowler, T.B. (Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tennessee 37830). *Nuclear Science and Engineering;* **83**: No. 1, 100-111(Jan 1983).

Calculational procedures have been implemented for solving importance and higher harmonic neutronics problems. Solutions are obtained routinely to support analysis of reactor core performance, treating up to three space coordinates with the multigroup diffusion theory approximation to neutron transport. The techniques used and some of the calculational difficulties are discussed.

2332 **American National Standard: requirements for reference reactor-physics measurements.** La Grange Park, IL; American Nuclear Society (1978). 9p. (ANSI/ANS—19.5-1978). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $12.00.

The purpose of this standard is to provide criteria for the qualification of reference reactor physics measurements obtained from subcritical (including non-multiplying), critical and other experiments for the purpose of verifying nuclear design and analysis methods. It provides guides for documentation of reference data and independent expert review of proposed reference reactor physics data to assure compliance with the criteria of this standard.

## 2202 Components And Accessories

*REFER ALSO TO CITATION(S) 2701, 2886, 3090, 3173*

2333 **(FEI—1326) Method for determining the mass of stagnant liquid during an infinite rod fuel assembly flowing round.** Voznyakevich, E.V.; Rogov, S.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703769.

A method for determining stagnant liquid mass based on simulation of potential flowing around of infinite rod fuel assembly of a nuclear reactor using electric current conducting paper is suggested. Formulae for calculating stagnant liquid mass by the known values of total current through the model electric potential applied to it and paper specific electric conductivity. Results of measurements performed on assemblies with square and triangular location of rods show that deviation of the obtained values from a mean value reaches +-5%.

2334 (INIS-mf—8473, pp 335-341) **Design criteria for rotating machinery to withstand fast electric bus transfer.** Schneller, S.G. (Canatom Ltd., Montreal, Quebec (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The electrical design of nuclear power plants provides for the rapid switching from a faulty supply bus to another in order to

ensure continuity of power to mechanical equipment. A switchgear with automatic transfer can complete this task in 1/10 sec. After the instant of disconnection the residual voltage and its frequency decay so that at the time of reconnection both a voltage and a phase difference exist at the motor terminals. This condition may give rise to excessive torque between winding and rotor. Both th electric motor and the connected equipment must be designed for this upset condition in order to prevent equipment failure. At early stages of plant design, when the specifications for mechanical equipment are issued to suppliers, the exact system characteristics are not known, consequently the precise expected overload cannot be ascertained. The object of this paper is to establish conservative, but realistic design criteria for the mechanical components that could be included in specifications without reference to electrical system parameters.

2335 **Determination of local and time-dependent pressure curves after sudden relief of pressure on containers and container combinations.** Heinrich, H.J. Berlin, Germany, F.R.; Bundesanstalt fuer Materialpruefung (1980). 10p. (In German). Bundesanstalt fuer Materialpruefung, Berlin (Germany, F.R.).

The pressure/time-history within pressurized vessels when vented directly into the surrounding atmosphere or into other closed vessels or into the atmosphere passing other vessels is investigated. The experimental results can be generalized and theoretically interpreted. In particular it is possible to calculate peak-pressures in vessels connected in series. (orig.).

## 2203 Fuel Elements

*REFER ALSO TO CITATION(S) 1927*

2336 (ANL/RERTR/TM—3, pp 81-89) **Fabrication of highly-loaded low-enrichment uranium aluminide fuel plates.** Newton, D.G. (EG & G Idaho, Inc., Idaho Falls). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Progress is reported on experimentation at Idaho National Engineering Laboratory with fabrication of highly-loaded low-enrichment uranium aluminide fuel plates. The objectives of the program were: (1) to develop the processes for producing experimental fuel plates with maximum practical UAl/sub x/ loadings using the standard rolling technique; and (2) to demonstrate that plates fabricated using these processes will perform satisfactorily. The target burnup was 60 to 80% of the fissile atoms. An upper limit of 52 vol % UAl/sub x/ was chosen as the practical limit for fabricability of this material.

2337 (ANL/RERTR/TM—3, pp 266-267) **Economic projections for advanced fuel fabrication.** Hassel, H.W. (NUKEM GmbH, Hanau, Germany). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

This paper presents a fabrication cost evaluation based on the status of MTR fuel development at NUKEM as of November 1980, and includes advanced chemical and mechanical processes starting with $UF_6$ (including chemical scrap recovery).

2338 (HEDL-SA—2858-FP) **Some unique applications of solid-state track-recorder autoradiography in the nuclear industry.** Ruddy, F.H.; Roberts, J.H.; Gold, R. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1983. Contract AC06-76FF02170. 13p. (CONF-830969—8). NTIS, PC A02/MF A01. Order Number DE84001483.

From 12. international conference on solid state nuclear track detectors; Acapulco, Mexico (4 Sep 1983).

CR-39 solid state track recorder alpha autoradiography has been applied to the inspection of sectioned weld samples of parts containing plutonium. In addition to determining the amounts of plutonium present, information on the distribution and physical form of the plutonium has been obtained. In a separate application, autoradiographic methods developed previously for analysis of airborne actinide aerosols are extended to the analysis of fuel debris at TMI-2. Autoradiographic determination of the alpha decay rate and the thermal neutron induced fission rate allows the $^{239}$(Pu/$^{235}$U ratio to be calculated on a particle-by particle basis. This ratio is in turn dependent on local power density in the reactor core. Correlations of the $^{239}$Pu/$^{235}$U ratio with particle size should provide useful data on mechanisms for core degradation and transport through the primary coolant system of the reactor.

2339 (JAERI-M—82-005) **Layer structures of oxide scales on zircaloy-4 tube exposed to steam-hydrogen mixture at high temperatures.** Motohashi, Haruhiko; Furuta, Teruo. (Japan Atomic Energy Research Inst., Tokyo). Mar 1982. 17p. (In Japanese). NTIS (US Sales On!y), PC A02/MF A01. Order Number DE83703772.

We have conducted oxidation experiments for zircaloy-4 tube in a mixed gas of steam and hydrogen at 1000 and 1050°C, and then made x-ray diffraction study for the oxide scales to determine the characteristics of products. It has been found that two different scales exist in the specimen depending on the composition of the mixed gas; one has single-layer structure composed of the monoclinic $ZrO_2$ phase and the other has the multi-layer structure composed of the monoclinic $ZrO_2$ phase at the surface, of the monoclinic and tetragonal $ZrO_2$ phase at the intermediate range and of the ZrO phase at the scale-metal interface of the specimen. The oxidation of the specimen with single-layer follows the parabolic rate law for an exposure time, whereas that with multi-layer follows the linear rate law during the initial oxidation process. In the specimen with multi-layer, the tetragonal $ZrO_2$ phase is found to transfer to the monoclinic phase with increasing the exposure time.

2340 **Temperature profile detector.** Tokarz, R.D. (to Dept. of Energy). US Patent 4,388,267. 14 Jun 1983. Filed date 29 Jan 1981. vp.

PAT-APPL-229496.

Temperature profiles at elevated temperature conditions are monitored by use of an elongated device having two conductors spaced by the minimum distance required to normally maintain an open circuit between them. The melting point of one conductor is selected at the elevated temperature being detected, while the melting point of the other is higher. As the preselected temperature is reached, liquid metal will flow between the conductors, creating short circuits which are detectable as to location.

2341 **Real-time nonlinear estimation of fuel-clad gap conductance.** Tylee, J.L. (EG & G Idaho, Inc., P.O. Box 1625, Idaho Falls, Idaho 83415). *Nuclear Science and Engineering;* **84**: No. 1, 58-60(May 1983).

Employing an extended Kalman filter, on-line estimates of gas gap conductance in a pressurized water reactor (PWR) fuel pin are obtained. A seventhorder, nonlinear model of a PWR is described. Implementing this model in the Kalman filter allows estimation of the reactor state vector, which includes gap conductance as an element. Using data from a test reactor facility, estimator performance is evaluted.

2342 **Determination of burnup in irradiated nuclear fuels by the method of stable $^{148}$Nd fission products.** Souza Sarkis, J.E. de. Sao Paulo, Brazil; Instituto de Pesquises Energetics e Nucleares (1982). 105p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

A method is described for the isotopic analysis and determination of burnup in irradiated nuclear fuel by mass spectrometric technique. The burnup is calculed from the determination of the concentration of uranium, plutonium and the fission product $^{148}$Nd in the samples of $UO_2$ irradiated fuel from a P.W.R. type reactor. The method involves the separation of fractions of uranium, plutonium and neodymium from the dissolved irradiated fuel by ion exchange technique. The determination of uranium, plutonium and the fission product $^{148}$Nd is carried out by isotope diluition mass spectrometry technique using as isotope tracers the nuclides $^{233}$U, $^{242}$Pu and $^{150}$Nd. For the chemical processing and handling of the irradiated sample a Hot Chemistry Laboratory was mounted. It consists of glove boxes and equipments for radiation monitoring

and protection. The results obtained indicate an atom percent burnup of 2.181 + - 0.035% wich corresponds an 20.937 + - 0.739 Gwd/ton of thermal energy produced.

## 2204 Control Systems

*REFER ALSO TO CITATION(S) 2335, 3173*

2343 **(HEDL-SA—2829) Leak-rate qualification of the FFTF control area.** Billings, M.P.; Swenson, L.D. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1983. Contract AC06-76FF02170. 20p. (CONF-830695—8). NTIS, PC A02/MF A01. Order Number DE84001481.

From Health Physics Society annual meeting; Baltimore, MD, USA (19 Jun 1983).

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Positive experience with the Fast Flux Test Facility (FFTF) Control Area boundary has demonstrated that strigent requirements for reactor control room leak-tightness can be met and maintained. Guidance contained in 10CFR50, Appendix A, Criteria 4 and 19, and Regulatory Guides 1.78 and 1.95 provided criteria for control room habitability, to provide safe, central control of the FFTF plant under normal and accident conditions. A leak rate criterion of 178 scfm for the approximate 53,000 cu. ft. Volume of the Control Area was established for the limiting condition of airborne sodium oxide aerosols from a postulated fire in one of the three secondary sodium loops. Numerous tests utilizing a variety of leak identification techniques were conducted.

2344 **(INIS-mf—8283) Improvements and standardization of communication means for control room personnel in nuclear power plants.** Preuss, W.; Eggerdinger, C.; Sieber, R. (Technischer Ueberwachungs-Verein Rheinland e.V., Koeln (Germany, F.R.). Inst. fuer Unfallforschung; Technischer Ueberwachungs-Verein Bayern e.V., Muenchen (Germany, F.R.). Inst. fuer Biomedizin und Ergonomie). 1982. 295p. (In German). NTIS (US Sales Only), PC A13/MF A01. Order Number DE83704398.

This report describes the findings of an investigation into selected communication means for control room personnel in nuclear power stations. The study can be seen as a contribution to the systematic analysis of major problem areas which were identified in the general study 'Human factors in the nuclear power plant'. The subjects under investigation were the 'Shift book', 'Simulation book', and 'Technical and organisational changes and their records'. It was intended to analyse both the communication, processes and the associated written documentation in order to determine areas for potential improvement and possibilities for standardization. Information was obtained by interviewing shift members and their supervisors, by general observation, and by compilation and evaluation of the extensive documentation. Assessment criteria were developed on a scientific basis and in the course of the investigation, in particular from ergonomic findings, as well as from standards and regulations and comparison between the plants. General practical suggestions were developed for the improvement of the communication forms and the formal design of the documents and their contents. The transfer of the recommendations to practical use in the plants presupposes the consideration of plant-specific frames of reference. The report includes a compilation and listing of suggestions for improvement in topical subdivisions. (orig.).

2345 **(INIS-mf—8447) Inspection and maintenance plans. In-service inspections.** Hanaberger, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1980. 28p. (CONF-8009308—57). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703309.

From IAEA interregional training course on safety analysis; Karlsruhe, F.R. Germany (3 Sep 1980).

In the first part of this lecture the reasons, objects and applications of a check and Maintenance Plan are discussed. Then the Scope of Check in-service inspection and the problems with working in radiation danger zones are dealt with. Finally technical suppositions to fulfill in the case of repair are named.

2346 **(ZfK—477) Location procedure for sound sources in reactor-technical enclosures.** Hamann, D. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Jul 1982. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703761.

A passive method requiring one detector only has been developed for the location of sound emitting faults in nuclear power plant components. It is adapted for use in a frequency range the wavelength of which is of the same order of magnitude as characteristic dimensions of the considered enclosure. The location is performed in the following way: (1) For a fixed detector position the Auto Power Spectral Density (APSD) of the source to be located is measured. (2) For this detector position the APSD is calculated for the potential source locations. For this, the free-field APSD as well as the acoustic normal modes of the enclosure are necessary. (3) The measured APSD is compared with the theoretically obtained APSD's. (4) That APSD is determined which is most similar to the measured APSD, and consequently an information about the unknown source position is got.

2347 **Results of the poolside nondestructive examination of irradiated control blades removed from BWRs.** Wilczedk, S.W. Jr.; Untermyer, S. (Niagara Mohawk Power Corp., 300 Erie Blvd. West, Syracuse, NY 13202). *Transactions of the American Nuclear Society;* **44**: 238-239(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

## 2205 Environmental Aspects

*REFER ALSO TO CITATION(S) 3112, 3113, 3114, 3115, 3116*

2348 **(DPST—71-590) Thermal-effects study.** Brown, R.J. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 4 Jan 1972. Contract AC09-76SR00001. 4p. NTIS, PC A02/MF A01. Order Number DE84002057.

Heated effluent water from SRP nuclear reactors is discharged into streams and swamps on the plant site before flowing into the Savannah River. The present study presents temperature and flow descriptions of the effluent streams, swamps, and Savannah River. The thermal contribution of SRP to the river is well within the limits imposed by the South Carolina Pollution Control Authority.

2349 (IAEA-SR—72, pp 74-89) **Canadian nuclear air cleaning standards and their application in Ontario Hydro.** Kabat, M.J. (Ontario Hydro, Toronto (Canada)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/6).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

A series of standards for high efficiency nuclear air cleaning systems is being prepared in Canada as a part of Environmental Radiation Protection Standards under development by the N288 Technical Committee of the Canadian Standards Association. The series comprises four parts: N288.3.1: General Requirements for Nuclear Air Cleaning Systems; N288.3.2: High Efficiency Nuclear Air Cleaning Assemblies for Normal Operation; N288.3.3: High Efficiency Nuclear Air Cleaning Assemblies for Emergency and Cleanup Operation; N288.3.4: Testing of High Efficiency Nuclear Air Cleaning Assemblies. The objectives of these standards will be discussed and their contents outlined. The performance and testing requirements for nuclear air cleaning systems are based in part on Ontario Hydro experience. These standards specifically take account of the chemical behaviour of hypoiodous acid (HOI), whose presence has been confirmed in CANDU stations by field measurements. The performance requirements and methodologies in these standards have been used in establishing the routine testing program for air cleaning assemblies in Ontario Hydro. The procedures used in the testing of absorber efficiency for the removal of methyl iodide, hypoiodous acid and elemental iodine, and practical experience will be discussed.

2350 (IAEA-SR—72, pp 510-515) **Analysis of the five years in-situ control of the cleaning filters used in the nuclear installations in France.** Dupoux, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Protection et de Surete Nucleaire, Dept. de Protection, Service de Protection Technique). May 1983. (In French). NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/13).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The exhaust filters of French nuclear installations have been subjected for many years to in-situ testing. The tests are carried out by using the SODA-FLUORESCENT aerosol method (AFNOR NFX 44011 standard). The summary of results obtained is presented. The influence of certain parameters such as filtration velocity, the layout and method of construction of the flow circuits and life span are indicated.

2351 **American National Standard: liquid radioactive-waste-processing system for light-water-reactor plants.** La Grange Park, IL; American Nuclear Society (1979). 49p. (ANSI/ANS—55.6-1979). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $35.00.

This standard sets forth minimum design, construction and performance requirements, with due consideration for operation, for Liquid Radioactive Waste Processing Systems for light water reactor plants, for routine operation including design basis fuel leakage, and other design basis occurrences. Design requirements and recommendations, as well as quality requirements, are presented. Various methods of treating and disposing of input quantities of liquid radioactive waste are discussed along with sizing, capacity, arrangement and redundancy of the systems. Instrumentation and control requirements are provided as well as quality requirements, are presented. Various methods of treating and disposing of input quantities of liquid radioactive waste are discussed along with sizing, capacity, arrangement and redundancy of the systems. Instrumentation and control requirements are provided as well as operating guidance to assure that the performance, safety and operational objectives of this standard are met.

## 2206 Research, Test, And Experimental Reactors

*REFER ALSO TO CITATION(S) 2337, 2405, 2407, 2408, 2439, 2466, 2505, 2510*

2352 (ANL/RERTR/TM—3) **Proceedings of the international meeting on development, fabrication and application of reduced enrichment fuels for research and test reactors.** (Argonne National Lab., IL (USA)). Aug 1983. Contract W-31-109-ENG-38. 677p. (CONF-801144—). NTIS, PC A99/MF A01. Order Number DE84000189.

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

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Separate abstracts were prepared for each of the papers presented in the following areas: (1) Reduced Enrichment Fuels for Research and Test Reactors (RERTR) Program Status; (2) Fuel Development; (3) Fuel Demonstrations; (4) General Topics; and (5) Specific Reactor Applications.

2353 (ANL/RERTR/TM—3, pp 14-19) **Objectives and status of the German AF program.** Thamm, G.H. (Kernforschungsanlage, Juelich, Germany). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The objectives of the AF (reduction of enrichment in research reactors) Program are: (1) to develop research reactor fuels with high uranium density to allow enrichment reduction on the basis of a fuel element design as near as possible to the current designs with minimal loss in reactor performance; (2) to develop fuel fabrication technologies which enable fuel element production on industrial scale; (3) to develop concepts for converting existing research reactors to reduced enrichment and for constructing new research reactors on the basis of 20% enrichment; and (4) to test fuel plates (of reduced size) and full size elements under irradiation conditions required for quality assurance and licensing requirements in the Federal Republic of Germany.

2354 (ANL/RERTR/TM—3, pp 20-35) **JAERI RERTR program.** Sato, M. (Japan Atomic Energy Research Inst., Oarai, Ibaraki-ken). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

In 1979, Japan Atomic Energy Research Institute (JAERI) started a five year program for the utilization of reduced enrichment uranium fuel, in place of currently used highly enriched uranium fuel for the JAERI research and test reactors. The program is aimed at reducing proliferation potential. The JAERI program is outlined: (1) core design and safety analysis; (2) flow tests; (3) critical experiments; (4) irradiation tests; and (5) full-core demonstration tests. The JAERI-ANL joint study to assess the feasibility of converting the JAERI reactors to use of fuel with reduced enrichment uranium is also discussed.

2355 (ANL/RERTR/TM—3, pp 36-50) **Licensing procedures and safety criteria for core conversion in Japan.** Kanda, K.; Nakagome, Y.; Hayashi, M. (Kyoto Univ., Osaka, Japan). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Procedures relating to the construction and operation of reactor facilities are discussed. Specifically, the Safety Analysis Report on the Kyoto University Critical Assembly (KUCA) core conversion (93% to 45% enrichment) is noted. The results of critical experiments in the KUCA and of burnup tests in the Oak Ridge Research (ORR) Reactor will be used in the final determination of the feasibility of the conversion of the Kyoto University High Flux Reactor (KUHFR) to the use of 45% enrichment.

2356 (ANL/RERTR/TM—3, pp 63-64) **Note on experience with MTR fuel in the United Kingdom.** Panter, R. (United Kingdom Atomic Energy Authority, Harwell). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The accumulated experience of metal alloy MTR elements has been extremely good, and has allowed up-rating of many MTR's with relaxation of fission product monitoring.

2357 (ANL/RERTR/TM—3, pp 90-115) **Status of uranium-silicon alloy fuel development for the RERTR program.** Domagala, R.F.; Wiencek, T.C.; Thresh, H.R.; Stahl, D. (Argonne National Lab., IL). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

As part of the national Reduced Enrichment Research and Test Reactor (RERTR) Program, Argonne National Laboratory (ANL) is engaged in a fuel-alloy development project. The fuel alloys are dispersed in an aluminum matrix and metallurgically roll-bonded within 6061 Al alloy. To date, miniplates with up to 40 vol. % fuel alloy have been successfully fabricated. Thirty-one of these plates have been or are being irradiated in the Oak Ridge Reactor (ORR). Three different fuels have been used in the ANL miniplates: $U_3Si$, $U_3Si_2$, or $U_3SiAl$. All three are candidates for permitting higher fuel loadings and thus lower enrichments than would be possible with either UAl/sub x/ or $U_3O_8$, the current fuels for plate-type elements. The enrichment level employed at ANL is ~ 19.8%. Continuing effort involves the production of miniplates with up to ~ 60 vol. % fuel, the development of a technology for full-

size plate fabrication, and post-irradiation examination of miniplates already removed from the ORR Reactor.

2358 (ANL/RERTR/TM—3, pp 116-141) **Irradiation testing of miniature fuel plates for the RERTR program.** Senn, R.L.; Martin, M.M. (Oak Ridge National Lab., TN). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—). Contract W-7405-ENG-26.

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

An irradiation test facility, which provides a test bed for irradiating a variety of miniature fuel plates (mini-plates) for the Reduced Enrichment Research and Test Reactors (RERTR) program, has been placed into operation. The objective of these tests is to screen various candidate fuel materials as to their suitability for replacing the highly-enriched uranium fuel materials currently used by the world's test and research reactors with a lower enrichment fuel material, without significantly degrading reactor operating characteristics and power levels. The use of low-uranium enrichment of about 20% $^{235}U$ in place of highly enriched fuel for these reactors would reduce the potential for $^{235}U$ diversion. Fuel materials currently being evaluated in this first phase of these screening tests include aluminium-base dispersion-type fuel plates with fuel cores of: (1) high uranium content $U_3O_8$-Al being developed by ORNL; (2) high uranium content UAl/sub x/-Al being developed by EG & G Idaho, Inc.; and (3) very high uranium content $U_3Si$-Al being developed by ANL. The irradiation test facility, designated as HFED-1, is operating in core position E-7 in the Oak Ridge Research Reactor (ORR), a 30-MW water-moderated reactor. Ultimately, fuel plate types with suitable characteristics will be manufactured into full-sized plate-type fuel elements suitable for testing in the ORR. Specifications for these elements are described in Appendix A.

2359 (ANL/RERTR/TM—3, pp 142-155) **Improved capability of U-ZrH fuels.** Gietzen, A.J. (General Atomic Co., San Diego, CA). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

A brief background on TRIGA fuels and a summary of the development of U-ZrH fuels utilizing higher uranium loadings in the alloy are presented. Applications being made by General Atomic Company with these higher alloy fuels is emphasized.

2360 (ANL/RERTR/TM—3, pp 176-198) **Producibility studies using UAl/sub x/ for low enrichment fuel plates.** Atkins, D.F. (Rockwell International, Canoga Park, CA). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The objective of this development study was to demonstrate the ability to produce acceptable fuel plates with high UAl/sub x/ loadings. For this study, Michigan size fuel plates were used. The resulting fuel plates were nondestructively evaluated using the fluoroscope, ultrasonic inspection, min-gauge inspection, radiography, void-volume determination, and visual inspection. Metallography was conducted to determine core thickness, grain growth across interfaces, and the minimum cladding thickness. The test matrix evaluated uranium concentrations between 40 vol %, the current baseline, and 80 vol %. Two different plate thicknesses were also evaluated. Fully enriched uranium was used in the study, but for plate loading calculations, it will be considered as 20% enrichment.

2361 (ANL/RERTR/TM—3, pp 201-221) **Status of fuel element technology for plate type dispersion fuels with high uranium density.** Hrovat, M.F. (NUKEM GmbH, Hanau, Germany); Huschka, H.; Koch, K.H.; Nazare, S.; Ondracek, G. Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The present state of development of fuel elements with high uranium density at NUKEM is reported. The development work has been concentrated on UAl/sub x/, $U_3O_8$, and $UO_2$ fuels, but some work has been done with U-Si and U-Fe compounds.

2362 (ANL/RERTR/TM—3, pp 222) **Contribution of French industry to RERTR (state of development in September 1980).** Fanjas, Y.; Dewez, P.; Savornin, B. (CERCA, Romans-sur-Isere, France). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

In order to compensate for the loss of $^{235}U$ due to the reduced enrichment of uranium to be used in research and test reactors, a development program in order to reach higher uranium densities in the fuel meat both for UAl/sub x/-Al and $U_3O_8$-Al fuel dispersions was initiated; on another hand the possibilities of $U_3Si$-Al remain a great point of interest. As far as UAl/sub x/ and $U_3O_8$ are concerned, the following results have been obtained: for any core thickness between 0.5 and 1.5 mm, 2.2 g/cm$^3$ of total U can be introduced in the meat with UAl/sub x/ fuel and 3.2 g/cm$^3$ of total U with $U_3O_8$ fuel, in respect to the most severe specifications. Combining these loadings and, when necessary and feasible, the increase of core thickness, it is thus already possible to convert most of low and medium power reactors either to 45 or 20% enrichment.

2363 (ANL/RERTR/TM—3, pp 223-247) **Development of lower enrichment fuels for Canadian research reactors.** Feraday, M.A.; Belanger, L.; Foo, M.T.; Grolway, C.M. (Atomic Energy of Canada Ltd., Chalk River, Ontario). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

As part of the worldwide move to proliferation resistant fuels, new fuels which use reduced enrichment uranium are being developed for use in the NRX and NRU reactors. A fuel consisting of particles of a USiAl alloy dispersed in an Al matrix has been selected for development along with Al-37 wt % U alloy and Al-$U_3O_8$ cermet as backup fuels. This report outlines the progress made in the development of the Al-USiAl and Al-37 wt % U. Results show that good quality extruded rods containing either fuel can be made with techniques similar to those used to fabricate the current NRX and NRU fuels. However, the new fuels will be more expensive to make. Although the oxidation behavior of the Al-USiAl is not as good as that of the Al-U alloys, its corrosion behavior in high temperature water does not seem much worse. The oxidation and aqueous corrosion of Al-37 wt % U are not much different from those of the Al-U alloys currently used.

2364 (ANL/RERTR/TM—3, pp 248-249) **Reduced enrichment activities in Denmark.** Jensen, A. (Risoe National Lab., Roskilde, Denmark). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

This paper briefly describes on-going activities in Denmark concerning reduction of uranium enrichment in research reactor fuels.

2365 (ANL/RERTR/TM—3, pp 250-251) **Note on current position regarding the development by the UKAEA of reduced enrichment fuels for research and test reactors.** Hickey, B. (UKAEA Dounreay Nuclear Power Development Establishment). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The United Kingdom Atomic Energy Agency (UKAEA) has an MTR fuel fabrication plant whose prime function is to manufacture fuel elements for the DIDO and PLUTO heavy water reactors. Following the initiative of the US government's RERTR program the UKAEA embarked on a modest program of fuel de-

velopment, manufacturing, irradiation, and post-irradiation examination to establish the techniques required to manufacture fuel elements containing uranium of significantly lower enrichment than those currently manufactured. A summary of progress to date is given.

2366 (ANL/RERTR/TM—3, pp 252) **LEU fuel development activities in Argentina.** Giorsetti, D.; Perez, E. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Work from 1978 to present is summarized for the Argentine CNEA program to develop fuels with high uranium density for use in the 3.5 MW RA-3 reactor.

2367 (ANL/RERTR/TM—3, pp 283-292) **Petten activities in the RERTR field.** von der Hardt, P. (Commission of the European Communities, Petten, Netherlands). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The purpose of this paper is to describe how the High Flux Reactor (HFR) at the Petten Establishment of the Joint Research Centre (JRC) fits into the total scheme of the reduced-enrichment effort as one of the irradiation facilities for tests on reduced enrichment fuels. The HFR Petten is an ORR-type reactor which has been upgraded to a license level of 50 MW.

2368 (ANL/RERTR/TM—3, pp 293-309) **Irradiation tests of fuel and fuel elements under the German AF program - revised test program.** Thamm, G. (Kernforschungsanlage, Juelich, Germany). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

This paper presents a revised irradiation test program of fuel plates and fuel elements to be carried out in Germany under the German Anreicherungsreduzierung in Forschungsreaktoren (AF) Program. The main objective of the irradiation test program of the AF Program is to demonstrate that reduced-enrichment uranium (REU) fuels fulfill the same safety criteria during reactor operation as do the current high-enriched uranium (HEU) fuels. The important safety aspects to be considered during the tests are corrosion behavior, stability of the fuel particles in the presence of the matrix and cladding materials, swelling, plutonium buildup, fission-product release, burnup limits, and overload behavior. The irradiation tests in the Federal Republic of Germany have to provide all of the data required for the licensing of an HEU to REU conversion. The participants in the German irradiation test program are listed.

2369 (ANL/RERTR/TM—3, pp 310-318) **Caramel fuel in OSIRIS: the complete conversion of a high flux research to a low enriched fuel.** Cherruau, F. (Centre d'Etudes Nucleaires de Saclay, Gif-sur-Yvette, France). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

ISIS, a mock-up reactor of OSIRIS, was completely loaded with caramel fuel elements in October 1978 and OSIRIS, after transformations that took place during 1979, begun its operation with a new caramel core in January 1980. Since this date, OSIRIS is operating at 70 MWth, its nominal power, using exclusively caramel fuel elements. Equilibrium enrichment of this new fuel is 7% as against the 93% previously used in the reactor, assembly's overall geometry and power remaining unchanged. This paper presents the main characteristics of the caramel fuel, a description of the transformations to OSIRIS that were decided in line with its conversion and the results of its operation since then.

2370 (ANL/RERTR/TM—3, pp 319-344) **Study of $UO_2$ wafer fuel for very high-power research reactors.** Hsieh, T.C.; Jankus, V.Z.; Rest, J.; Billone, M.C. (Argonne National Lab., IL). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The Reduced Enrichment Research and Test Reactor Program is aimed at reducing fuel enrichment to < 20% in those research and test reactors presently using highly enriched uranium fuel. $UO_2$ caramel fuel is one of the most promising new types of reduced-enrichment fuel for use in research reactors with very high power density. Parametric studies have been carried out to determine the maximum specific power attainable without significant fission-gas release for $UO_2$ wafers ranging from 0.75 to 1.50 mm in thickness. The results indicate that: (1) all the fuel designs considered in this study are predicted not to fail under full-power operation up to a burnup of $1.09 \times 10^{21}$ fis/cm$^3$; (2) for all fuel designs, failure is predicted at approximately the same fuel centerline temperature for a given burnup; (3) the thinner the wafer, the wider the margin for fuel specific power between normal operation and increased-power operation leading to fuel failure; (4) increasing the coolant pressure in the reactor core could improve fuel performance by maintaining the fuel at a higher power level without failure for a given burnup; and (5) for a given power level, fuel failure will occur earlier at a higher cladding surface temperature and/or under power-cycling conditions.

2371 (ANL/RERTR/TM—3, pp 345-387) **Safety analysis calculations for research and test reactors.** Chen, S.Y.; MacDonald, R.; MacFarlane, D. (Argonne National Lab., IL). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Safety issues for the two general types of reactors, i.e., the plate-type (MTR-type) reactor and the rod-type (TRIGA-type) reactor, resulting from the changes associated with LEU vs HEU fuels, are explored. The plate-type fuels are typically uranium aluminide (UAl/sub x/) compounds dispersed in aluminum and clad with aluminum. Moderation is provided by the water coolant. Self shut-down reactivity coefficients with HEU fuel are entirely a result of coolant heating, whereas with LEU fuel there is an additional shut down contribution provided by the direct heating of the fuel due to the Doppler coefficient. In contrast, the rod-type (TRIGA) fuels are mixtures of zirconium hydride, uranium, and erbium. This fuel mixture is formed into rods (~ 1 cm diameter) and clad with stainless steel or Incoloy. In the TRIGA fuel the self-shutdown reactivity is more complex, depending on heating of the fuel rather than the coolant. Results of transient calculations performed with existing computer codes, most suited for each type of reactor, are presented.

2372 (ANL/RERTR/TM—3, pp 433-449) **Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB.** Roegler, H.J. (Interatom, Bergisch Gladbach, Germany). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Based on the overall agreement about methods and principal results on core conversions from HEU to REU within the work done for the IAEA Guidebook, investigations about the conversions of the German Research Reactors within the German AF-Program were begun. The first step of this work was done for the three low power MTR-reactors in Germany. These are the BER II in Berlin operating at 5 MW, the FMRB in Brunswick operating at 1 MW, and the FRM near Munich operating at 4 MW. A short overview about the status of the three reactors, presenting their cores and specific design features, is given.

2373 (ANL/RERTR/TM—3, pp 450-498) **Core physics analysis in support of the FNR HEU-LEU demonstration experiment.** Losey, D.C.; Brown, F.B.; Martin, W.R.; Lee, J.C. (Univ. of Michigan, Ann Arbor). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

A core neutronics analysis has been undertaken to assess the impact of low-enrichment fuel on the performance and utilization of the FNR. As part of this analytic effort a computer code system has been assembled which will be of general use in analyzing research reactors with MTR-type fuel. The code system has been extensively tested and verified in calculations for the present high enrichment core. The analysis presented here compares the high- and low-enrichment fuels in batch and equilibrium core configurations which model the actual FNR operating conditions. The two fuels are compared for cycle length, fuel burnup, and flux and power distributions, as well as for the reactivity effects which are important in assessing the impact of LEU fuel on reactor shutdown margin.

2374 (ANL/RERTR/TM—3, pp 499-547) **RERTR demonstration experiments program at the Ford Nuclear Reactor.** Wehe, D.K.; King, J.S. (Univ. of Michigan, Ann Arbor). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The purpose of this paper is to highlight a major part of the experimental work which is being carried out at the Ford Nuclear Reactor (FNR) in conjunction with the RERTR program. A demonstration experiments program has been developed to: (1) characterize the FNR in sufficient detail to discern and quantify neutronic differences between the high and low enriched cores; (2) provide the theoretical group with measurements to benchmark their calculations.

2375 (ANL/RERTR/TM—3, pp 548-566) **Neutronic performance of a 14 MW TRIGA reactor: LEU vs HEU fuel.** Bretscher, M.M.; Snelgrove, J.L.; Cornella, R.J. (Argonne National Lab., IL). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

A primary objective of the US Reduced Enrichment Research and Test Reactor (RERTR) Program is to develop means for replacing, wherever possible, currently used highly-enriched uranium (HEU) fuel ($^{235}$U enrichment $>$ 90%) with low-enriched uranium (LEU) fuel ($^{235}$U enrichment $<$ 20%) without significantly degrading the performance of research and test reactors. The General Atomic Company has developed a low-enriched but high uranium content Er-U-ZrH/sub 1.6/ fuel to enable the conversion of TRIGA reactors (and others) from HEU to LEU. One possible application is to the water-moderated 14 MW TRIGA Steady State Reactor (SSR) at the Romanian Institute for Nuclear Power Reactors. The work reported here was undertaken for the purpose of comparing the neutronic performance of the SSR for HEU fuel with that for LEU fuel. In order to make these relative comparisons as valid as possible, identical methods and models were used for the neutronic calculations.

2376 (ANL/RERTR/TM—3, pp 567-578) **KUCA critical experiment program using HEU and MEU fuel.** Kanda, K. (Kyoto Univ. Research Reactor Inst., Osaka, Japan). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The Kyoto University Research Reactor Institute (KURRI) has designed and plans to construct the 30 MW Kyoto University High Flux Reactor (KUHFR). KURRI is engaged in a joint study program with the Argonne National Laboratory (ANL) on the core conversion of the KUHFR from highly enriched uranium to moderately enriched uranium fuel. The Kyoto University Critical Assembly (KUCA) is a facility for measuring core characteristics for the planned KUHFR. The KUCA experimental program and the conversion study are outlined.

2377 (ANL/RERTR/TM—3, pp 632-636) **Status of RA3 conversion studies.** Testoni, J. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Studies carried out in Argentina for the conversion of the RA-3 3.5 MW reactor to reduced enrichment fuel dealt with neutronic, thermal hydraulic, and safety analysis, as well as fuel manufacture. Some of the results for the neutronic studies are reported.

2378 (ANL/RERTR/TM—3, pp 637) **Comments on applications of reduced enrichment fuels.** Winkler, M.H. (Federal Institut fuer Reaktroforschung, Switzerland). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The experience gained using different fuels in the SAPHIR reactor in Switzerland is briefly described.

2379 (ANL/RERTR/TM—3, pp 638-643) **Core optimization studies at JEN - Spain.** Gomez Alonso, M. (Junta de Energia Nuclear, Madrid, Spain). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

The JEN-1 is a 3MW reactor which uses flat-plate fuel elements. It was originally fueled with 20% enriched uranium but more recently with 90% enriched fuel. It now appears it will be converted back to using 20% fuel. Brief history of operation and progress toward the conversion is reported.

2380 (ANL/RERTR/TM—3, pp 644-660) **Comparison of some measurements in the Greek Research Reactor-1 (GRR-1) with 20% and 93% enriched uranium fuel elements.** Chrysochoides, N.G.; Zikides, C.; Mitsonias, C.; Papastergiou, C. (Nuclear Research Center Democritus, Athens, Greece). Aug 1983. NTIS, PC A99/MF A01. (CONF-801144—).

From International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors; Argonne, IL, USA (13 Nov 1980).

Experimental results of the core performance of the GRR-1 with 20% and 93% enriched $^{235}$U are compared. In particular, the rod worth, the flux distribution (axial and radial), the temperature, and the void effects are analyzed and compared for the two cores. The experimental results are in good agreement with benchmark calculations for this reactor and for other similar reactors. Although the fuel elements of the two cores do not have the same number of plates, the results are of special significance, since they present the only experimental comparative work known so far on the core conversion problem from the use of highly enriched uranium to the use of low enriched uranium fuels.

2381 **(EUR—7931) 1981 Annual Status Report. Operation of the high flux reactor.** (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). 1982. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703782.

The operation of the reactor will continue to the benefit of the research programmes of the participating Member States and for the JRC's own requirements. Outside clients will also be able to use the irradiation facilities on payment. During the next programme the teams will continue the maintenance and upgrading of the reactor and the development and improvement of the irradiation equipment and apparatus to enable this installation to hold its place among the most important means of irradiation of the Community.

2382 **(EUR—8082) Annual report 1981. Joint Research Centre Petten Establishment.** (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). 1981. 52p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703830.

In this 1981 report, the first chapter introduces the Establishment's activities during the year, followed by brief accounts of the three major programmes assigned to Petten. The scientific work is then described in Chapters II and IV with selected topics being presented in Chapters III and V. The remainder of the report contains charts and tables concerned with staff and budgetary matters and finally a list of technical publications and contributions to conferences made during the year. The year has seen heavy demands being made on the facilities, both the High Flux Reactor and Materials Research installations being fully occupied for most of the time, important results being obtained in both these fields.

2383 **(HEDL-SA—2755-FP) FFTF shield and gamma-ray measurements.** Bunch, W.L.; Moore, F.S.; Stinson, W.P. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1983. Contract AC06-76FF02170. 15p. (CONF-830538—19). NTIS, PC A02/MF A01. Order Number DE84001478.

From 6. international conference on radiation shielding; Tokyo, Japan (16 May 1983).

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An extensive measurements program was carried out prior to routine operation of the Fast Flux Test Facility (FFTF) to establish (1) the attenuation characteristics of the reactor shield, (2) the nuclear environment in the core, and (3) to assure that the facility could be operated safely from the standpoint of radiological considerations. Reactor shield neutron fluxes were measured primarily using radioactivant detectors irradiated in special test vehicles placed at assessible locations. Preliminary evaluation of the data indicated shield performance consistent with design calculations. Gamma ray measurements employed a variety of ionization chambers and calorimeters as well as thermoluminescent dosimeters, selfpowered gamma ray detectors, and thermal expansion difference temperature monitors. The gamma ray experimental results are consistent and also in relatively good agreement with analytical predictions. Plant shield survey employed standard radiation survey instruments.

2384 (IAEA-SR—72, pp 469-470) **Airborne radioactivities in the gas cooling and ventilation systems of the research reactor RA-Vinca.** Vujisic, L.; Todorovic, M. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/33).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

2385 (IAEA-SR—72, pp 48-55) **Experiences in radioactive gaseous effluent management in JAERI.** Yoshida, Y.; Matsui, H.; Yamamoto, H.; Ikezawa, Y.; Hirayama, K.; Kokubu, M. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/27).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

In the Japan Research Reactor-II (JRR-2), the main source of $^{41}Ar$ generation is the exhaust air from the horizontal experimental holes and the pneumatic tubes. For the horizontal experimental holes, the flow of exhaust air through the holes was decreased by improving the airtightness, and a decay duct of capacity 2.4 $m^3$ was installed in the middle of the exhaust line. In consequence, the release rate of $^{41}Ar$ was reduced by 6-8%. For the pneumatic tubes, a mechanical shutter was installed in the tube. The shutter stops the exhaust air flow, except when the pneumatic tube is used. Prior to the use, the activated air in the tube is led to a decay tank. As a result, the $^{41}Ar$ release rate was reduced by 10-20%. By the above means, the yearly exposure at the site boundary was reduced to 0.36 mR from 2.6 mR. In Hot Laboratory for metallurgical examination of spent fuel, the exhaust filtration system consists of filters in the cave, i.e. frame trap, prefilter, HEPA filter, and the main filter system, i.e. prefilter, two-stage HEPA filter and charcoal filter (the charcoal filter is by-passed to lengthen its life when radioiodine is not released). Values of removal efficiency and the dispersion factor for iodine were 80% and $4.4x10^{-3}$ and for cesium 97% and $3.5x10^{-3}$, respectively. The exhaust filtration system in Radioactive Waste Incineration Plant consists of a two-stage ceramic filter installed immediately after the incinerator, air cooler, two-stage HEPA filter and final scrubber. The decontamination factor of the two-stage ceramic filter is $1x10^6$ for particulate matter, when measured with radioactive particles from burning of simulated contaminants with 75 mCi of $^{137}Cs$. The decontamination factor of the HEPA filter after the ceramic filter is about $10^3$. The overall decontamination factor for the plant is estimated to be more than $10^6$.

2386 **(IAEA-TC—389/6-13) Development on experimental VHTR instrumentation.** Wakayama, N.; Ara, K.; Terada, H.; Yamagishi, H.; Tomoda, T. (International Atomic Energy Agency, Vienna (Austria); Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Jun 1982. 15p. (CONF-820653—20). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703788.

From IAEA specialists' meeting on gas-cooled reactor core and high temperature instrumentation; Cumbria, UK (15 Jun 1982).

This paper describes developmental works on the instrumentation of the Experimental VHTR. In the area of the nuclear instrumentation for the reactor control, high temperature fission counterchambers have been developed. These withstood the accelerated irradiation life tests at 600 deg. C, the long term in-reactor operating test at 600 deg. C and the 800 deg. C-operating tests for several hundred hours in a simulated accident condition. Platinum-Molybdenum alloy thermocouples have been studied as a neutron-irradiation-resistant high-temperature thermocouple for the in-core temperature distribution monitoring of the VHTR in the temperature range between 1000 deg. C and 1350 deg. C. The instability problems of the Pt-5% Mo/Pt-0.1% Mo thermocouple seem to be overcome by introducing a double sheath structure and adopting a better material to the inner sheath. A local failure and abnormality monitoring method for the HTR fuel is also studied using a gas-sweeping irradiation rig for the CPF compacts. This study aims mainly at the development of a method to compensate for the dependency of the FP-release rate on the fuel temperature, the neutron flux density, the burn-up and others, in order to increase the detection sensitivity of fuel failures.

2387 (INIS-mf—8473, pp 87-93) **Small reactors for low-temperature heating.** Hilborn, J.W.; Glen, J.S. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

For regions which do not have abundant long term supplies of oil, gas, or electricity, small nuclear reactors for heating large buildings are a future energy option. In Canada, the first installations might be in remote arctic communities where heating costs are highest. Atomic Energy of Canada Limited is studying the feasibility of small units in the range 2 to 20 MWt. Based on the inherently safe SLOWPOKE research reactor, the proposed heating reactor would produce hot water at temperatures less than 100°C. It would be unattended most of the time, responding automatically to daily variations in load demand. The reactor core would contain enough uranium fuel to last two heating seasons. Thermohydraulic tests have been carried out on an electrically heated tube simulating a single fuel element, and a 31-element test rig simulating the core and primary coolant circuit is under construction. Preliminary cost estimates indicate that heat from a 2MWt SLOWPOKE-type reactor compares favourably in cost with heat from electricity and imported oil, but is significantly more expensive than the corresponding energy from natural gas. If the current studies at the Chalk River Nuclear Laboratories confirm technical and economic feasibility, a 2 MWt prototype reactor will be built at Chalk River in 1984/85.

2388 **(INIS-mf—8551) Pt. 1: Decommissioning of nuclear facilities. Pt. 2: Methods of decommissioning of nuclear facilities.** Steinkilberg, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 10p. (CONF-8209134—24). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703599.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

In the present paper the different steps of dismantlement of nuclear facilities are dealt with. First the planning principles for decomminconing are discussed and then the planning of the reactorblock dismantlement in the FR2 research reactor is described. (RW).

2389 **(JAERI-M—82-012) Semiannual progress report on the NSRR experiments, (12). January, 1981 to June, 1981.** Hoshi, Tatsuo; Ishii, Toshio; Onishi, Nobuaki. (Japan Atomic Energy Research Inst., Tokyo). Mar 1982. 131p. (In Japanese). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703783.

Fuel behavior studies in simulated reactivity initiated accident (RIA) conditions have been performed by utilizing Nuclear Safety Research Reactor (NSRR) since October, 1975. This report describes the results obtained from January, 1981 to June, 1981. A total of 38 tests were carried out during this period; those are 5 standard fuel rod tests (2 scoping tests and 3 high energy deposition tests), 10 fuel design parameter tests (4 pre-pressurized rod tests, 4 stainless steel cladding fuel rod tests, 1 gap gas composition parameter test and 1 embrittled cladding fuel test), 6 cooling condition parameter tests (5 forced convection tests and 1 bundle rod test), 10 defective fuel rod tests (7 waterlogged fuel rod tests and 3 fretting corroded fuel rod tests), 1 fuel behavior observation tests, 1 water loop test and 5 miscellaneous tests.

2390 **(JAERI-M—82-016) Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980.** (Japan Atomic Energy Research Inst., Tokyo). Mar 1982. 292p. (In Japanese). NTIS (US Sales Only), PC A13/MF A01. Order Number DE83703784.

Activities of the Division of Research Reactor Operation in fiscal 1979 are described. The division is responsible for operation and maintenance of JRR-2, JRR-3, JRR-4 and Hot Laboratory. In the above connection, various other works are performed, including technical management of fuel and coolant, radiation control, irradiation technique, etc. In Hot Laboratory, postirradiation examinations of fuels and materials are made, and also development of examination methods.

2391 **(KURRI-TR—216) Flow test for the full scale core mockup of the KUHFR, (1). Velocity distribution and pressure loss in the core.** Mishima, Kaichiro; Araki, Yasusuke; Ishikawa, Yoshiaki. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 27 Oct 1981. 53p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703785.

The flow test using a full scale mockup of the core of the Kyoto University high flux reactor (KUHFR) has been performed as a part of the research and development of the KUHFR which is planned by the Research Reactor Institute, Kyoto University. The pressure loss and the velocity profile at various locations in the core were measured, which are very difficult to measure in the actual reactor core. In this paper, the results obtained by the experiment are reported. The flow rate of coolant through the mockup was up to 1940 $m^3/h$, approximately 1.8 times as much as the normal flow rate. The velocity profile at the inlet and outlet of the core was obtained with Pitot tubes. The calculation of the flow distribution and pressure loss in the core was performed with the computer code FLODIST. The comparison of these results revealed the following facts. The relation between the total flow and pressure loss in the core can be estimated by calculation. The coolant velocity is approximately distributed according to 1/n-th power of the distance from the wall, and the velocity profile is not much affected by the flow rate. The fraction of flow distributed to the outer fuel elements was smaller than the estimation.

2392 **(KURRI-TR—220) Report of research by common utilization in Research Reactor Institute, Kyoto University, in first half of fiscal 1980.** (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1982. 59p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703827.

In the technical report, the data required for research and experiment, such as the result of functional test of various experimental facilities, the test results of the products manufactured for trial, the state of radiation control and waste treatment, and the reports of study meetings, or the remarkable results and new methods obtained in research, and the discussion on other papers and reports in the Research Reactor Institute, Kyoto University, are summarized as prompt report. The subject, reporters and synopsis of 54 papers are reported in this publication.

2393 **(NIIAR—16(531)) Complex of hardware and software means for fission product detection in the fast reactor sodium coolant and cover gas.** Glushak, N.S.; GLushak, S.M.; Krajnov, E.V.; Starozhukov, D.I. (Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)). 1982. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703780.

An automatic system for monitoring the fission product activities in the sodium coolant and cover gas of the BDR-60 reactor used for the fuel can tightness control is described. Generalized flowsheet of the system is gaven. Software used for measurement result processing is described as well. System hardware consists of two semiconductor Ge(Li)-detectors of gamma radiation, two independent spectrometric channel commutation, multichannel analyzer on the base of the M-6000 computer with timer and a spectrum stabilization block. The spectrometer operates continuously during the whole reactor lifetime and provides automatic monitoring the time behaviour of nuclides in sodium coolant ($^{135}Xe$, $^{131}I$, $^{133}I$, $^{137}Cs$, $^{132}I$, $^{134}Cs$, $^{136}Cs$, $^{24}Na$, $^{138}Cs$) and 9 nuclides in cover gas ($^{133}Xe$, sup(85m)Kr, $^{89}Kr$, $^{135}Xe$, $^{87}Kr$, $^{138}Xe$, $^{41}Ar$, sup(135m)Xe, $^{88}Rb$). During the fixed period of time (usually 0.5-3 h) the spectrometer makes in turn 12 spectrum acquisitions for each channel. Time of one spectrum acquisition is 1-5 min. It is concluded that the system considered is a suitable instrument for development of gamma spectrometric methods for fuel can tightness control at an operating reactor.

2394 **(NUREG/CR—3370) Evaluation of nuclear facility decommissioning projects. Summary report: North Carolina State University Research and Training Reactor.** Link, B.W.; Miller, R.L. (UNC Nuclear Industries, Inc., Richland, WA (USA). Decommissioning Programs Dept.). Aug 1983. 39p. NTIS, PC A03/MF A01 - GPO $3.75. Order Number DE84900263.

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This document summarizes information from the decommissioning of the NCSUR-3 (R-3), a 10 KWt university research and training reactor. The decommissioning data were placed in a computerized information retrieval/manipulation system which permits future utilization of this information in pre-decommissioning activities with other university reactors of similar design. The information is presented both in some detail in its computer output form and also as a manually assembled summarization which highlights the more significant aspects of the decommissioning project. Decommissioning data from a generic study, NUREG/CR 1756, Technology, Safety and Costs of Decommissioning Nuclear Research and Test Reactors, and the decommissioning of the Ames Laboratory Research Reactor (ALRR), a 5 MWt research reactor, is also included for comparison.

2395 **(PNC-N—941-81-239) Power coefficient anomaly in Joyo, (2). Presumption about the causing mechanism.** Ishikawa, Makoto; Yamashita, Yoshioki; Sasaki, Makoto; Nara, Yoshihiko. (Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). Dec 1981. 70p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703781.

In this report, the presumption about the mechanism having caused the power coefficient anomaly in Joyo during the 75 MW

power-raising test in 1979 is described. After the previous report, the new information about the results of the post-irradiation examination and the analysis of the power coefficient of Joyo were able to be obtained. From this information, the mechanism of causing the anomaly was presumed as follows. In 50 MW operation, the fuel burnup reached about 10,000 MWD/ton at the end of second cycle, and most of the produced fission gas was retained in fuel pellets. When the power was raised from 50 MW to 75 MW for the first time, the fission gas began to be released when 50 MW was somewhat exceeded. The fission gas release caused a temperature rise and cracking of fuel pellets, and increased the fuel stack length abruptly. These phenomena induced an increase in fuel expansion reactivity effect and Doppler reactivity effect, and caused the anomalous behavior of power coefficient. After reaching 75 MW, the fuel stack length did not respond normally to reactor power change, and the magnitude of power coefficient became smaller. The reactivity was lost considerably from the core after the anomaly.

2396 **(UCRL—89797) Neutron and gamma-ray measurements on the LANL Little Boy Comet Assembly.** Hankins, D.E. (Lawrence Livermore National Lab., CA (USA)). Sep 1983. Contract W-7405-ENG-48. 8p. (CONF-8309153—2). NTIS, PC A02/MF A01. Order Number DE84002469.

From Seminar on measurements and calculations on the replica of Little Boy; Los Alamos, NM, USA (13 Sep 1983).

We measured the neutron and gamma-ray dose rates at various distances from the Little Boy Comet Assembly at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico on April 28 and 29, 1983. The distances selected varied from 350 ft to 1860 ft from the assembly, with the latter point being located at the edge of the mesa overlooking Pajarito Canyon. We varied the power levels for the various runs but we have normalized all of them to a single power-level. We also made corrections for the variations in the power-level indicators of the assembly using data provided by LANL.

2397 **A program of hands-on training in the operation of a critical assembly facility.** Malenfant, R.E.; Plassmann, E.A. (Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **44**: 41-42(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2398 **Experience with hands-on training at the Los Alamos critical assemblies facility.** Lopez, C.F.; Andrade, B.R.; Malenfant, R.E.; Pena, B.; Robles Galvez, J.C. (Inst. Nacional de Investigaciones Nucleares). *Transactions of the American Nuclear Society;* **44**: 42-43(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2399 **Responsibilities and tasks of nuclear research centers in developing countries.** Servian, J.L. (Uruguayan AEC/ Uruguay, CNEA, Casilla de Correo 970, Montevideo). *Transactions of the American Nuclear Society;* **42**: 191(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2400 **Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience.** Iyengar, P.K. (BARC/India, Bhabha Atomic Research Center, Bombay 400 085). *Transactions of the American Nuclear Society;* **42**: 192-193(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2401 **Non destructive burn up determination of IEA-R1 reactor fuel elements by gamma-ray spectrometry using a Ge(Li) detector.** Madi Filho, T. Sao Paulo, Brazil; Instituto de Pesquises Energetices e Nucleares (1982). 107p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

A non destructive determination of burn up of low (IEA-14) and high (IEA-80) activity fuel elements used in the IEA-R1 pool reactor was made from the measured distribution of the Cs-137 gamma-ray activity in these elements. For both series of measurements a 73,7 c.c. Ge(Li) detector was used in 'well collimated' geometry. Where as IEA-14, removed from the reactor some 20 years, showed a gamma-ray spectrum essentially due to Cs-137, IEA-80, with a cooling time of 5 years, showed a more complex spectrum due to the greater number of fission products remaining. The S.I out-of-pool assembly was calibrated using Cs-137 and Co-60 point and Ag-110m plane sources. These measurements provided the necessary constants used to calculate fuel burn-up from measured relative activity distributions of fuel elements. Detailed fuel plate transmission measurements made with the Cs-137 source showed the plates to be highly homogeneous. High activity fuel elements were measured in the S.II in-pool assembly in which the detector was locate on the moveable pool bridge and the test element was positioned immediately below the detector 2.17m below the pool surface. Measurements made in the S.II assembly were normalised with respect to the measured activity of the IEA-14 element. The measured burn up of the IEA-14 and IEA-80 elements obtained in this work is $3.22.10^{-3}$gms and 24.44gms. These values may be compared with respective values of $2.63.10^{-3}$gms and 61.11gms given by 'total reactor energy/flux distribution' calculations. Calculated errors for the U-235 burn up are 7.4% (IEA-14) and 10.1% (IEA-80). A detailed evaluation of the errors associated with both sets of measurements is given.

2402 **Calculation of the probability to occur accidents at IEA-R1 reactor.** Frajndlich, R. Sao Paulo, Brazil; Instituto de Pesquises Energetices e Nucleares (1982). 152p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

The procedures and basic elements involved in the calculation of the reliability of safety systems of the IEA-R1 research reactor are studied. A summary description of the reactor systems, fail trees for the three systems components, the computer codes and numerical results, is done. Comments are made based on these results.

## 2207 Plutonium And Isotope Production Reactors

*REFER ALSO TO CITATION(S) 2342*

## 2209 Reactor Safety

*REFER ALSO TO CITATION(S) 1926, 2304, 2305, 2307, 2313, 2365*

2403 **(BNL-NUREG—33665) NRC plant-analyzer development at BNL.** Wulff, W. (Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-76CH00016. 3p. (CONF-8310143—3). NTIS, PC A02/MF A01 - GPO. Order Number DE83014024.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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The objective of this program is to develop an LWR engineering plant analyzer capable of performing realistic and accurate simulations of plant transients and Small-Break Loss of Coolant Accidents at real-time and faster than real-time computing speeds and at low costs for preparing, executing and evaluating such simulations. The program is directed toward facilitating reactor safety analyses, on-line plant monitoring, on-line accident diagnosis and mitigation and toward improving reactor operator training. The AD10 of Applied Dynamics International, Ann Arbor, MI, a special-purpose peripheral processor for high-speed systems simulation, is programmed through a PDP-11/34 minicomputer and carries out digital simulations with analog hardware in the input/output loop (up to 256 channels). Analog signals from a control panel are being used now to activate or to disable valves and to trip pump drive motors or regulators without interrupting the simulation. An IBM personal computer with multicolor graphics capabilities and a CRT monitor are used to produce on-line labelled diagrams of selected plant parameters as functions of time.

2404 **(CONF-830607—26) Reassessment of PWR pressure-vessel integrity during overcooling accidents.** Cheverton, R.D.; Ball, D.G. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 29p. (CONF-830868—1). NTIS, PC A03/MF A01. Order Number DE83017204.

From American Society of Mechanical Engineers pressure vessel and piping conference; Portland, OR, USA (19 Jun 1983).

A continuing analysis of the PTS problem associated with PWR postuated OCA's indicates that the previously accepted degree of conservatism in the fracture-mechanics model needs to be more closely evaluated, and if excessive, reducted. One feature that was believed to be conservative was the use of two-dimensional as opposed to finite-length (three-dimensional) flaws. A flaw of particular interest is one that is located in an axial weld of a plate-type vessel. For those vessels that suffer relatively high radiation damage in the welds, the length of the flaw will be no greater than the length of the weld, and recent calculations indicate that a deep flaw of that length (~ 2 m) is not effectively infinitely long, contrary to previous thinking. The benefit to be derived from consideration of the 2-m flaw and also a semielliptical flaw with a length-to-depth ratio of 6/1 was investigated by analyzing several postulated transients. In doing so the sensitivity of the benefit to a specified maximum crack arrest toughness and to the duration of the transient was investigated. Results of the analysis indicate that for some conditions the benefit in using the 2-m flaw is substantial, but it decreases with increasing pressure, and above a certain pressure there may be no benefit, depending on the duration of the transient and the limit on crack arrest toughness.

2405 **(CONF-830702—23) Severe fuel-damage scoping test performance.** Gruen, G.E.; Buescher, B.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 7p. NTIS, PC A02/MF A01. Order Number DE84000561.

From 21. ASME/AIChE national heat transfer conference; Seattle, WA, USA (24 Jul 1983).

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As a result of the Three Mile Island Unit-2 (TMI-2) accident, the Nuclear Regulatory Commission has initiated a severe fuel damage test program to evaluate fuel rod and core response during severe accidents similar to TMI-2. The first test of Phase I of this series has been successfully completed in the Power Burst Facility at the Idaho National Engineering Laboratory. Following the first test, calculations were performed using the TRAC-BD1 computer code with actual experimental boundary conditions. This paper discusses the test conduct and performance and presents the calculated and measured test bundle results. The test resulted in a slow heatup to 2000 K over about 4 h, with an accelerated reaction of the zirconium cladding at temperatures above 1600 K in the lower part or the bundle and 2000 K in the upper portion of the bundle.

2406 **(CONF-831235—2) Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations.** Meek, C.C.; Doerner, R.C. (Argonne National Lab., IL (USA)). 1983. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01. Order Number DE84000587.

From 22. IEEE conference on decision control; San Antonio, TX, USA (14 Dec 1983).

Kalman filter methodology has been applied to inpile liquid-metal fast breeder reactor simulation experiments to obtain estimates of the fuel-clad thermal gap conductance. A transient lumped parameter model of the experiment is developed. An optimal estimate of the state vector chosen to characterize the experiment is obtained through the use of the Kalman filter. From this estimate, the fuel-clad thermal gap conductance is calculated as a function of time into the test and axial position along the length of the fuel pin.

2407 **(DPST—83-780) Technical bases for offsite emergency planning at SRP.** Crawford, T.V.; Olson, H.P. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 26 Aug 1983. Contract AC09-76SR00001. 8p. NTIS, PC A02/MF A01. Order Number DE84002819.

A recent DOE Order requires the development of site specific Emergency Planning Zones (EPZ) for all DOE reactor and nonreactor nuclear facilities. One input to the establishment of EPZs is the distance from the site at which EPA Protection Action Guides (5 rem whole body and 25 rem individual organ) are met for a range of possible accidents at individual facilities. A review of SARs for SRP facilities indicated that distance calculations should be done for the fuel and target manufacturing facilities in the 300 Area (because of the short distance to the site boundary) and for the reactors in the 100 Areas (because of the possible magnitude of the release). Results of calculations for these facilities are summarized in this memorandum.

2408 **(EGG-M—07083) Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility.** Grush, W.H.; Woerth, S.C.; Koizumi, Y. (EG and G Idaho, Inc., Idaho Falls (USA); Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). 1983. Contract AC07-76ID01570. 9p. (CONF-830702—26). NTIS, PC A02/MF A01. Order Number DE84000562.

From 21. ASME/AIChE national heat transfer conference; Seattle, WA, USA (24 Jul 1983).

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An anticipated transient without scram (ATWS), initiated by a loss of feedwater, was experimentally simulated in the Loss-of-Fluid Test (LOFT) pressurized water reactor (PWR). Primary system pressure was controlled using a two-position actuator relief valve to simulate a scaled power-operated relief valve (PORV) and safety relief valve (SRV) representative of those in a commercial PWR. Auxiliary feedwater injection was delayed during the experiment until the plant recovery phase where long-term shutdown was achieved by an operator-controlled plant recovery procedure without inserting the control rods. The system transient response predicted by the RELAP5/MOD1 computer code showed good agreement with the experimental data.

2409 **(EGG-M—08683) Feasibility study on feed and bleed for pressurized-water reactors.** Chen, Y.S.; Sullivan, L.H.; Shimeck, D.J. (EG and G Idaho, Inc., Idaho Falls (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1983. Contract AC07-76ID01570. 9p. (CONF-830702—24). NTIS, PC A02/MF A01. Order Number DE84000564.

From 21. ASME/AIChE national heat transfer conference; Seattle, WA, USA (24 Jul 1983).

By injecting coolant with a high pressure emergency core cooling system, and removing the heated/vaporized fluid by way of the pressurizer power operated relief valve, primary feed and bleed cooling denotes an operation whereby reactor core cooling is maintained. This paper presents the results from an experimental and analytical study that includes a simplified analysis of mass and energy balances associated with the feed and bleed, examination of test data from the Semiscale system, RELAP5 code analyses of both Semiscale and a four-loop Westinghouse plant, and the primary coolant system behavior for a transient that leads to the need for feed and bleed. Examination of the parameters that govern a stable feed and bleed operation identifies four key parameters such as: (a) core decay heat, (b) cooling water injection capacity, (c) power operated relief valve (PORV) energy removal rate, and (d) PORV mass removal rate. A simplified analytical approach to determining if stable feed and bleed is feasible, has been developed and corroborated by experimental data and computer code calculations.

2410 **(EGG-M—24682) Comparisons of the SCDAP computer code with bundle data under severe accident conditions.** Allison, C.M.; Beers, G.H. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 7p. (CONF-830805—54). NTIS, PC A02/MF A01. Order Number DE84000662.

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

The SCDAP computer code, which is being developed under the sponsorship of the United States Nuclear Regulatory Commission, models the progression of light water reactor core damage including core heatup, core disruption and debris formation, debris heatup, and debris melting. SCDAP is being used to help identify and understand the phenomena that control core behavior during a severe accident, to help quantify uncertainties in risk assessment analysis, and to support planning and interpretation of severe fuel damage experiments and data. Comparisons between

SCDAP calculations and the experimental data showed good agreement. Calculated and measured bundle temperatures for SFD-ST were within 200 K for the entire bundle and within 20 K for maximum cladding temperatures. For ESSI-2, calculated and measured maximum cladding temperatures were within 50 K, and the extensive liquefaction and relocation that was calculated was in agreement with experimental results.

2411 **(EGG-M—27682) Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility.** Varacalle, D.J. Jr.; Koizumi, Y.; Giri, A.H.; Koske, J.E.; Sanchez-Pope, A.E. (EG and G Idaho, Inc., Idaho Falls (USA); Public Service Co. of New Hampshire, Seabrook (USA); Japan Atomic Energy Research Inst., Tokai, Ibaraki; Framatome, 92 - Paris La Defense (France)). 1983. Contract AC07-76ID01570. 9p. (CONF-830702—25). NTIS, PC A02/MF A01. Order Number DE84000560.

From 21. ASME/AIChE national heat transfer conference; Seattle, WA, USA (24 Jul 1983).

An anticipated transient without scram (ATWS), initiated by loss-of-offsite power, was experimentally simulated in the Loss-of-Fluid Test (LOFT) pressurized water reactor (PWR). Primary system pressure was controlled using a scaled safety relief valve (SRV) representative of those in a commercial PWR, while reactor power was reduced by moderator reactivity feedback in a natural circulation mode. The experiment showed that reactor power decreases more rapidly when the primary pumps are tripped in a loss-of-offsite-power ATWS than in a loss-of-feedwater induced ATWS when the primary pumps are left on. During the experiment, the SRV had sufficient relief capacity to control primary system pressure. Natural circulation was effective in removing core heat at high temperature, pressure, and core power. The system transient response predicted using the RELAP5/MOD1 computer code showed good agreement with the experimental data.

2412 **(EGG-PBS—6379) One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program.** Nigg, D.W. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1983. Contract AC07-76ID01570. 117p. NTIS, PC A06/MF A01. Order Number DE84002038.

Nuclear reactor core transient neutronic behavior is currently modeled in the TRAC-BD1 code using a point-reactor kinetics formulation. This report describes a set of subroutines based on the Analytic Nodal Method that were written to provide TRAC-BD1 with a one-dimensional space-dependent neutronics capability. Use of the routines is illustrated with several test problems. The results of these problems show that the Analytic Nodal neutronics routines have desirable accuracy and computing time characteristics and should be a useful addition to TRAC-BD1.

2413 **(HEDL-SA—2835-FP) Thermal-buckling analysis of an LMFBR overflow vessel.** Severud, L.K. (Hanford Engineering Development Lab., Richland, WA (USA)). 1983. Contract AC06-76FF02170. 15p. (CONF-830805—64). NTIS, PC A02/MF A01. Order Number DE84001482.

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

During a reactor scram, cold sodium flows into the hot overflow vessel. The effect on the vessel is a compressive thermal stress in a zone just above the sodium level. This condition must be sufficiently controlled to preclude thermal buckling. Also, under repeated scrams, the vessel should not suffer thermal stress low cycle fatigue. To evaluate the closeness to buckling and satisfaction of ASMA Code limits, a combination of simple approximations, detailed elastic shell buckling analyses, and correlations to results of thermal buckling tests were employed. This paper describes the analysis methods, special considerations, and evaluations accomplished for this FFTF vessel to assure satisfaction of ASME buckling design criteria, rules, and limits.

2414 **(HEDL-SA—2839) Seismic analysis of a nonlinear airlock system.** Huang, S.N. (Hanford Engineering Development Lab., Richland, WA (USA)). Jan 1983. Contract AC06-76FF02170. 29p. (CONF-830607—29). NTIS, PC A03/MF A01. Order Number DE84001493.

From American Society of Mechanical Engineers pressure vessel and piping conference; Portland, OR, USA (19 Jun 1983).

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The containment equipment airlock door of the Fast Flux Test Facility utilizes screw-type actuators as a push-pull mechanism for closing and opening operations. Special design features were used to protect these actuators from pressure differential loading. These made the door behave as a nonlinear system during a seismic event. Seismic analyses, utilizing the time history method, were conducted to determine the seismic loads on these scew-type actuators. Several sizes of actuators were examined. Procedures for determining the final optimum design are discussed in detail.

2415 **(HEDL-SA—2884a) Hydrogen mixing in compartments with a high-velocity source.** Bloom, G.R.; Postma, A.K. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1983. Contract AC06-76FF02170. 7p. (CONF-830816—47). NTIS, PC A02/MF A01. Order Number DE84001488.

From International meeting on light-water reactor severe accident evaluation; Cambridge, MA, USA (28 Aug 1983).

Hydrogen mixing test results are analyzed for two simulated high-velocity hydrogen-steam releases from postulated small coolant-line breaks into the lower compartment of an ice-condenser plant. The tests, which in most cases used helium as a simulant for hydrogen, demonstrated that the lower compartment gas was well mixed for both hydrogen release conditions used. The annular test compartment had a helium-steam or hydrogen-steam source, atmosphere-recirculation system, and containment vent. Measured local hydrogen or helium concentrations are compared with values calculated assuming perfect gas mixing in individual compartments. Normally a 25% relative error was observed between calculated and observed values when the average compartment hydrogen or helium concentration was about 4 volume percent.

2416 **(IABG-B-TF—1337) Study on the design basis accident 'aircraft impact on nuclear power plant'.** Bauer, J.; Schwarz, R. (Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (Germany, F.R.)). 31 Oct 1982. 173p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751361.

This report contains the analysis of an accidental impact of a Phantom F-4F Jet against the secondary containment of a present PWR-plant. The different submodels which have been used for the simulation of the effects of such an external event are described and the results are presented.

2417 **(INIS-mf—8268) Systems study for development of a core catcher for LWR-type reactors. Final report/materials.** Schimetschka, E.; Boehm, B.; Kuhn, W.; Langer, G.; Petereins, R. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Mar 1983. 33p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704403.

The present project covered the development of self-consistent technical concept of a core catcher device for the hypothetical case of an unimpeded core-meltdown accident. The device is to catch and safely retain the core melt that has left the reactor pressure vessel and to dissipate the decay heat generated in the melt to the outside, without releasing fission products into the environment. The project encompassed also the technical evaluation of the concept.

2418 **(INIS-mf—8408) Cooling systems, emergency cooling, recooling.** Meyer, P.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 22p. (CONF-8109220—30). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703312.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

After an introductory survey of Cooling Systems in a PWR, the paper discusses residual heat removal, nuclear component and service cooling systems and finally emergency feedwater systems.

2419 **(INIS-mf—8411) PWR and BWR safety systems layout.** Meyer, P.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 17p. (CONF-8109220—28). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703310.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The paper deals with basic safety philosophy and protection against fission product release, with shielding in NPPs and discusses internal and external incidents or events and quality assurance measures.

2420 **(INIS-mf—8413) Dynamics of a nuclear power plant. Behaviour of PWR plants during malfunctions and accidents.** Stelzer, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 26p. (CONF-8109220—32). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703314.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

Analyses of malfunctions and accidents or transients which is the comprehensive term for all events without loss of coolant must be carried through because they form one of the essential bases for design of the total plant. Only by knowledge of both mechanical and thermal loads resulting from the transient's analyses the single component or systems of the plant can be appropriately laid out. This interrelation between the results of transients analysis and system design will be demonstrated by means of some typical examples of transients. The transients will be discussed in detail by exposition of the sequence of events and explaining the major physical phenomena. Due to the fact that these analyses play an important role in the licensing procedures the lecture will also enter the particulars of how far official rules and regulations determine the scope of transient analyses.

2421 **(INIS-mf—8414) Dynamics of a nuclear power plant. Behaviour of PWR plants in normal and upset operation.** Stelzer, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 29p. (CONF-8109220—33). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703315.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The lecture deals with the essential characteristics determining the behaviour of a PWR under normal and upset operating conditions. Beside the self-regulatory behaviour (inherent safety.) the most important control systems for coolant temperature and pressure and main steam pressure are discussed. The steady-state part load behaviour will be illustrated, also under the aspect of operating modes leading to a deviation from the actual load condition (e.g. reactivity and load changes). Contrary to normal operation upset operation mostly implies a reduction of reactor power to at least a lower part load level. Typical examples for that are load rejection or turbine trip and the failure of one main collant pump. However, in some cases of upset operation such as faulty closing of one MS isolating valve the plant is tripped to zero load hot. By no means upset operation causes a longer standstill of the plant, such disturbances at most lead to short-term interruptions of the power operation.

2422 **(INIS-mf—8417) Layout of the components: Primary system components (class I).** Kley, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 20p. (CONF-8109220—34). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703316.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

The purpose of the lecture is to achieve a good understanding of the basic safety approach for the Components of the NSSS of a PWR.

2423 (INIS-mf—8473, pp 140-149) **CANDU safety research. A status report.** Hancox, W.T. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The objective of the CANDU reactor safety research program is to develop and verify computer models that accurately predict the behaviour of CANDU reactor process and safety systems during loss-of-coolant accidents. The strategy is to establish a sound theoretical basis for the models and to verify them systematically against experiments of increasing complexity. The major research tasks include the determination of fluid dynamic and heat transfer processes (collectively called thermalhydraulics) in the heat-transport system during the blowdown and emergency coolant injection phases of a LOCA; thermal and mechanical behaviour of the fuel and the fuel channel assembly in situations where the heavy-water moderator is the dominant heat sink; the chemical behaviour of fission gases that might be released into the reactor coolant and transported to the containment system, and the effects of combustion of hydrogen-air-steam mixtures in the containment system.

2424 (INIS-mf—8473, pp 150-156) **Experimental studies of reflooding in horizontal fuel channels.** Sawamura, O.; Funasaka, H.; Wakayama, M. (Electric Power Development Co. Ltd., Tokyo (Japan)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This paper describes the result of the experimental studies on reflooding in horizontal fuel channels. The experiments were performed in order to understand the thermohydraulic behaviour in horizontal fuel channels following a loss-of-coolant accident (LOCA) in the CANDU reactor. The basic reflooding behaviour in a horzontal fuel channel was made clear by the single-channel reflooding experiments. It was shown as a result of the multi-channel reflooding tests that the flow resistance of feeders in the outlet side, particularly that of the orifice in the inlet feeder in the event of a reactor inlet-side break, is an important factor affecting flow distribution among the channels and that it appears to be very important to properly determine the discharge-depressurization charateristics of the accumulator to reflood all the channels within a short enough time to avoid unacceptable sheath overheating. In addition, the threshold of flow stratification under conditions expected during reflooding was experimentally obtained.

2425 (INIS-mf—8473, pp 157-163) **Experimental investigation of heat transfer from a reactor fuel channel to surrounding water.** Gillespie, G.E. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment:. [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

An important feature of the CANDU-PHW reactor is that each fuel channel is surrounded by cool heavy-water moderator that can act as a sink for heat generated in the fuel if other means of heat removal were to fail. During postulated loss-of-coolant accidents there are two scenarios in which the primary cooling system may not prevent fuel-channel overheating. These situations arise when: (1) for a particular break size and location, called the critical break, the coolant flow through a portion of the reactor core stagnates before the emergency coolant injection system restores circulation, or, (2) the emergency coolant injection system fails to operate. In either case, the heat generated in the fuel is transferred mainly by radiation to the pressure tube and calandria tube, and then by boiling heat transfer to the moderator. This paper describes a simple one-dimensional model developed to analyse the thermal behaviour of a fuel channel when the internal pressure is high. Also described is a series of experiments in which the pressure-tube segment is pressurized and heated at a constant rate until it contacts a surrounding calandria-tube segment. Predictions of the one-dimensional model are compared with the experimental results.

2426 (INIS-mf—8473, pp 172-178) **Fault tree as a tool in safety analysis of nuclear power plants.** Waddington, J.G.; Wild, A. (Atomic Energy Control Board, Ottawa, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Fault tree analysis is the best technique available to identify those combinations of comparatively common events that could lead to significant fuel failures or radioactive release to the public, and to demonstrate that adequate independence has been achieved between malfunctioning systems and safety systems. A computer code, SIFTA, was written and implemented by the Canadian Atomic Energy Control Board. The code can handle trees with multiple top events and interleaved branches. Fault trees of over 1000 events have been analyzed using this code. It is also suitable for numerical evaluation of unavailabilities, failure rates, and failure probabilities.

2427 (INIS-mf—8473, pp 179-185) **PRESCON-2 simulation of the OECD/CSNI containment analysis standard problem no. 2.** Collins, W.M. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Atomic Energy of Canada Limited Engineering Company is a participant in the 'OECD-CSNI Containment Standard Problem No. 2' exercise, sponsored by the OECD-CSNI and hosted by the Federal Republic of Germany. The experimental program was initiated to provide results in a model containment for comparison with computer codes in order to make an assessment of the codes and to uncover possible modelling deficiencies. The test facility consists of a high pressure coolant system and a model containment (cylindrical in shape, diameter = 12 m) divided into several compartments. The test was performed by discharging a two phase mixture into the containment for a period of 50 s. The computer simulation was carried out using the PRESCON-2 containment code. Results of this simulation and a comparison with the experimental results are presented in this paper.

2428 (INIS-mf—8473, pp 186-192) **Separation of safety-related systems at Darlington GS A.** Palen, A.H.; Wong, R.; King, F.K.; Blevins, J.D. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This paper discusses the separation of safety-related systems at Darlington GS, a four-unit CANDU nuclear generating station under construction by Ontario Hydro on Lake Ontario, about 10 km east of Oshawa.

2429 (INIS-mf—8473, pp 258-266) **Reactor safety. Some current realities.** Meneley, D.A. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The people of Ontario have begun to receive the benefits of a low cost, assured supply of electrical energy from CANDU nuclear stations. This indigenous energy source also has excellent safety characteristics. Safety has been one of the central themes of the CANDU development program from its very beginning. A great deal of work has been done to establish that public risks are small. However, safety design criteria are now undergoing extensive review, with a real prospect of more stringent requirements being applied in the future. Considering the newness of the technology it is not surprising that a consensus does not yet exist; this makes it imperative to discuss the issues. It is time to examine the policies and practice of reactor safety management in Canada to decide whether or not further restrictions are justified in the light of current knowledge.

2430 (INIS-mf—8473, pp 437-439) **Realistic estimates of the consequences of nuclear accidents.** Levenson, M. (Bechtel Power Corp., San Francisco, CA (USA)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The risks of reactor accidents may have been overestimated. Reassessments should be done in several categories: fundamental chemistry, the behaviour of aerosols, the effects of time, and transport phenomena among others. Incorrect perception of the extent of possible public hazards can lead to non-optimum or even counterproductive policy decisions.

2431 (INIS-mf—8473, pp 245-252) **Preliminary nuclear decommissioning cost study.** Sissingh, R.A.P. (Ontario Hydro, Toronto (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

This preliminary nuclear decommissioning cost study addresses the technical and cost aspects of decommissioning Ontario Hydro's CANDU multi-unit nuclear stations. It concentrates on the logistical, technical and cost aspects of decommissioning, using Pickering GS A as the reference design. It has been found that with the exception of reactor core dismantlement, which will be done remotely, the dismantlement of all other systems and buildings can be accomplished using Ontario Hydro's current operating, maintenance and construction procedures and practices.

2432 (INIS-mf—8473, pp 169-171) **Fire protection program in CANDU stations.** Lee, S.P. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. Power Projects). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The fire protection program in CANDU stations employs a defense-in-depth approach. This program is applied from the design stage to the operating stage to achieve the objectives of nuclear safety, safety of operating personnel, and economic loss prevention. Fire prevention is achieved by design efforts together with administrative control in operation. Fire detection and suppression equipment are provided for each fire hazard in the station. Considerations are also given to the design and layout of the structures and systems to limit the influence of fires.

2433 (INIS-mf—8473, pp 351-357) **Experimental and analytical seismic study on 600 MWe CANDU core.** Kuroda, T.; Murakami, H.; Mizukoshi, K. (Electric Power Development Co. Ltd., Tokyo (Japan)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Following the completion of STEP I and II tests, a third and final test (STEP III) of the CANDU core seismic verification program was conducted by EPDC together with a supportive analytical study. The test provided further assurance of shut-off rod insertion capability in addition to information on collision behavior between guide tube and fuel channel assembly. Furthermore it was shown that the seismic response of the CANDU core including collision behavior can be predicted with an acceptable degree of confidence by analytical means. The findings obtained from this comprehensive program led to the conclusion that the CANDU core can maintain its safety function as well as its structural integrity under extemely strong earthquake motion excitation conditions.

2434 **(INIS-mf—8506) Three Mile Island 2. The accident of March 28, 1979, as seen from the point of view of radiation protection experts.** Mueller, W. (Kernenergie-Studiengesellschaft - Studiengesellschaft zur Foerderung der Kernenergieverwertung in Schiffbau und Schuffahrt e.V., Hamburg (Germany, F.R.)). 1980. 28p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703592.

Text of a paper presented to Studiengesellschaft zur Foerderung der Kernenergieverwertung in Schiffbau und Schiffahrt e.V., Hamburg, November 13, 1980.

The sequence of events since the accident on march 28, 1979 is outlined by means of the events of significance to radiation protection, followed by an account of the environmental monitoring scheme carried out to date, and its results. Special emphasis is placed on personnel monitoring and personnel dose commitment. The maximum and average whole-body doses measured in the environment of the plant are below the relevant annual natural radiation dose values. The problems encountered and the experience gained in radiation protection measures in the plant are presented. Three phases are discussed characterizing the conditions after the accident. The main point examined are the following steps of the third phase: decontamination of the reactor auxiliary building, evaluation of the current technical state of the plant, ventilation of the containment and inspection by the personnel. In view of the new and enormous requirements to be fulfilled by the personnel due to the accident, the consequences of this accident, as seen from the point of view of the radiation protection expert, can be regarded to be comparatively mild.

2435 **(INIS-mf—8530) System study on the development of a core catcher concept for light water reactors. Final report/main volume.** Schimetschka, E.; Baukal, W.; Boehm, B.; Kuhn, W.; Langer, G. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Dec 1982. 56p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703598.

A self-contained technical concept of a core-catcher system for the hypothetical case of an unimpeded core meltdown accident was developed. This core-catcher system is to collect the core melt which escapes from the reactor pressure vessel, safely retain it and dissipate the decay heat generated in the melt to the outside without releasing fission products into the environment. The concept is characterised by: - closed full-pressure steel containment; - sacrificial bed for diluting the melt; - removal of the decay heat in an all-passive mode; - capability to accept the dynamic loads resulting from core melting in the pressurised primary system; - use of refractory materials free from water for those components which come into contact with the core melt. Ultimate removal of the heat from the containment is effected by an outside spraying system - to be postulated. The necessity of measures to control hydrogen results mainly from the outside spraying system. Normal operation of the plant and design-base accidents will not be adversely affected by the core catcher system. Combination of all these characteristics and requirements in one single concept will, however, necessitate a modification of the existing plant concept and in general require major technical and construction efforts. The result of this study can be used as a sound basis for a costbenefit analysis.

2436 **(INIS-mf—8543) Core design with respect to the safety concept.** Kollmar, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1981. 54p. (CONF-8109220—44). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703596.

From IAEA interregional training course on nuclear power plant operational safety; Karlsruhe, F.R. Germany (7 Sep 1981).

In the present paper the following topics are dealt with: principles of reactor core design and optimization, fuel management and safety concept for higher cycles and results of risk analyses (e.g. rod ejection, steam line break etc.) (RW).

2437 **(INIS-mf—8602) Emergency plans for nuclear power accidents. Danish-Swedish exercise Oct 7th 1982.** Hoerjel, N.; Bjoerk, S. (eds.). (Laenstyrelsen i Malmoehus Laen, Malmoe (Sweden)). Apr 1983. 20p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704399.

The report presents an evaluation of an exercise of emergency services during a simulated accident at the nuclear power plant of Barsebaeck, Sweden. The aim of the exercise was to test Swedish and Danish organizations and various collaborative co-ordinations. Recommendations for future exercises are given. (G.B.).

2438 **(JAERI-M—82-075) SCTF Core-I test results. System pressure effects on reflooding phenomena.** Adachi, Hiromichi; Sudo, Yukio; Iwamura, Takamichi; Osakabe, Masahiro; Ohnuki, Akira; Hirano, Kemmei. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703773.

The Slab Core Test Facility (SCTF) of Japan Atomic Energy Research Institute (JAERI) was constructed to investigate two-dimensional thermohydrodynamics in the core and the communication in fluid behavior between the core and the upper plenum during the last part of blowdown, refill and reflood phases of a posturated loss-of-coolant accident (LOCA) of a pressurized water reactor (PWR). In the present report, effects of system pressure on reflooding phenomena shall be discussed based on the data of Tests S1-SH2, S1-01 and S1-02 which are the parameteris tests for system pressure effects belonging to the SCTF Core-I forced flooding test series. Major items discussed in this report are (1) hydrodynamic behavior in the system, (2) core thermal behavior, (3) core heat transfer and (4) two-dimensional hydrodynamic behavior in the pressure vessel including the core.

2439 **(JAERI-M—82-076) Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3.** Fujiki, Kazuo; Yoshida, Kazuo. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 44p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703774.

Thermal-hydraulic analysis of LOCE L3-6/L8-1, which is the one of loss-of-coolant experiments (LOCEs) in the loss-of-fluid test (LOFT) facility, was performed by using RELAP4/MOD6/U4/J3. Main purpose of the analysis is to assess the capability of the RELAP4/MOD6/U4/J3 code upon the analysis of a small break LOCA in a PWR. The code calculated the thermal-hydraulic behavior in the primary and secondary systems. Calculated results showed good agreement with measured data about break flow, pressure and temperature of the primary system and fluid densities in the intact loop, but the behavior of broken loop and steam generator secondary system were not calculated well. In the course of this analysis, some improvements were found to be necessary on the modeling of pump degradation and coast down, steam generator and stagnant fluid in the broken loop.

2440 **(JAERI-M—82-099) Improvement of core mass balance calculation in REFLA-1D/MODE1.** Okubo, Tsutomu; Murao, Yoshio. (Japan Atomic Energy Research Inst., Tokyo). Aug 1982. 39p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703823.

A computer code REFLA-1D/MODE1, which is used for an analysis of the reflood phase of LOCA, has been improved to eliminate unrealistic oscillations of the core mass balance calculation. In the improved core mass balance calculation, the void fraction at the quench front is evaluated and used explicitly in order to evaluate more precisely the mass balance above the quench front. The improvement eliminated the unrealistic oscillations of the core mass balance calculation without making any significant changes in the rest of the calculated results. Therefore, this improvement has increased the validity of the calculated results of that code. This is an important point especially for the system calculations.

2441 **(Juel—1833) Experimental investigations of actinide release from coated fuel particles for high-temperature reactors.** Teixeira e Silva, A. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Technische Hochschule Aachen (Germany, F.R.)). Mar 1983. 164p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751356.

The migrational behaviour of actinides in the coated fuel particles proposed for high-temperature reactors is investigated experimentally. Data are described in the framework of the diffusion

model. The experimental procedures are presented and the necessary computer codes are discussed. The diffusion coefficients of the actinides - plutonium, americium and curium - as well as of the fission product cesium are derived from the experimental data by a nonlinear least squares fit procedure and are presented in the form of Arrhenius lines D = Do esup(-Q/RT) for U(Th)-$O_2$, HTI-PyC and SiC.

2442 **(KAPL—4156) Local heat transfer where heated rods touch in axially flowing water.** Kast, S.J. (Knolls Atomic Power Lab., Schenectady, NY (USA)). May 1983. Contract AC12-76SN00052. 160p. NTIS, PC A08/MF A01. Order Number DE84000537.

An anlaytic model is developed to predict the azimuthal width of a stablesteam blanket region near the line of contact between two heated rods cooled by axially flowing water at high pressure. The model is intended to aid analysis of reduced surface heat transfer capability for the abnormal configuration of nuclear fuel rods bowed into contact in the core of a pressurized water nuclear reactor. The analytic model predicts the azimuthal width of the steam blanket zone having reduced surface heat transfer as a function of rod average heat flux, subchannel coolant conditions and rod dimensions. The analytic model is developed from a heat balance between the heat generated in the wall of a heated empty tube and the heat transported away by transverse mixing and axial convection in the coolant subchannel. The model is developed for seveal geometries including heated rods in line contact, a heated rod touching a short insulating plane and a heated rod touching the inside of a metal guide tube.

2443 **(KAPL—4157) Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program.** High, H.M. (Knolls Atomic Power Lab., Schenectady, NY (USA)). May 1983. Contract AC12-76SN00052. 93p. NTIS, PC A05/MF A01. Order Number DE84000817.

The predicted accident response for a light water moderated, thorium/U-233 fueled, seed-blanket reactor concept was assessed. The first part of the assessment compared breeder accident response with that of a current commercial pressurized water reactor design for several different types of transients. Based on these comparisons and a review of the various parameter differences between the breeder and a U-235 fueled plant, the second part of the assessment studied the breeder accident behavior in more detail, particularly in areas of potential concern. Based on the two parts of the assessment, it was concluded that the breeder accident response would be very similar to that of present commercial pressurized water reactor plants. The large Doppler and moderator reactivity coefficients of the breeder would significantly reduce the severity of many of the accidents that must be considered. It is expected that the accident response of the breeder can be shown to meet regulatory criteria.

2444 **(NUREG/BR—0051-Vol.5-No.1) Power reactor events, January-February 1983. Vol. 5, No. 1.** Massaro, S.A. (ed.). (Nuclear Regulatory Commission, Washington, DC (USA). Office for Analysis and Evaluation of Operational Data). Aug 1983. 48p. NTIS, PC A03/MF A01 - GPO. Order Number DE84900272.

Power Reactor Events is a bi-monthly newsletter that compiles operating experience information about commercial nuclear power plants. This includes summaries of noteworthy events and listings and/or abstracts of USNRC and other documents that discuss safety-related or possible generic issues. It is intended to feed back some of the lessons learned from operational experience to the various plant personnel, i.e., managers, licensed reactor operators, training coordinators, and support personnel.

2445 **(NUREG/CR—3417) Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4.** Adams, J.P. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1983. Contract AC07-76ID01570. 57p. (EGG—2267). NTIS, PC A04/MF A01 - GPO. Order Number DE84002341.

Experiments L9-3 and L9-4 were conducted on April 7, 1983, and September 24, 1983, respectively, in the Loss-of-Fluid Test facility. These experiments simulated a complete loss-of-feedwater (Experiment L9-3) and a station-blackout (Experiment L9-4) anticipated transient without scram. This report presents the experimental results and compares the data on postexperiment calculations made using the RELAP5/MOD1 computer code. Conclusions are drawn regarding the inherent ability of the plant to shut down the reactor without operator intervention, the effectiveness of a recovery procedure, and the ability of RELAP5/MOD1 to calculate the dominant phenomena.

2446 **(ORNL—5933, pp 102-110) Nuclear Regulatory Commission programs.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

Information on reactor safety research is presented concerning fission product release from HTGR reactors; fission product release from LWR fuel; LWR severe accident sequences analysis; postaccident fission product chemistry; aerosol transport in the reactor vessel; fission product interaction with aerosols; core-melt studies; and fission product and aerosol release source terms. Also discussed is research on geochemical support for repository licensing.

2447 **(ORNL—5933, pp 111-113) Three Mile Island support studies.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

The involvement of CTD staff members with recovery operations at the Three Mile Island Unit 2 Nuclear Power Station (TMI) has continued since shortly after the accident in 1979. Major efforts have been associated with work on decontamination and management of the accident water, which is coordinated through the Technical Advisory Group (TAG); participation in the Technical Assistance and Advisory Group (TAAG); and a number of specific tasks in support of the recovery program. Division staff members serve on both TAG and TAAG.

2448 **(PB—83-241562) Community's research and development programme on decommissioning of nuclear power plants (year 1981). Annual progress report No. 2.** (Commission of the European Communities, Luxembourg). 1981. 78p. (EUR—8343-EN). NTIS, PC E05/MF E05.

The progress and results of seven projects undertaken in 1981 are reported and guidelines having some bearing on decommissioning practices available in EEC Member States are being examined.

2449 **(PNL-SA—11214) LOCA rupture strains and coolability of full-length PWR fuel bundles.** Mohr, C.L.; Hesson, G.M. (Pacific Northwest Lab., Richland, WA (USA)). Mar 1983. Contract AC06-76RL01830. 26p. (CONF-830805—62). NTIS, PC A03/MF A01. Order Number DE83017869.

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

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The LOCA Simulation Program tests sponsored by the United States Nuclear Regulatory Commission are the first full-length nuclear-heated experiments designed to investigate the deformation and rupture characteristics as well as the coolability of nuclear-heated fuel under accident conditions. The results of the seven tests preformed in the program using 32-rod full-length PWR fuel bundles have shown that for a wide range of flow blockage condtions no significant reduction in coolability of the fuel bundle could be found. These results have been confirmed by data from out-of-pile electrically-heated experiments. Although there is a difference between nuclear and electrically-heated test data, the conclusion is still the same. Coolability of a deformed bundle during reflood is dominated by the dispersion of droplets in the deformed zone which provides adequate cooling and which is not reduced by the deformation of the fuel rod cladding.

2450 **(PNL-SA—11536) Summary results of the LOCA Simulation Program conducted in NRU.** Freshley, M.D.; Hesson, G.M. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1983. Contract AC06-76RL01830. 15p. (CONF-8310143—30). NTIS, PC A02/MF A01. Order Number DE84002596.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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The LOCA Simulation Program, which was successfully performed in the NRU reactor, produced significant quantitative data on the mechanical deformation behavior, flow blockage, and coolability of full-length PWR fuel rods operating under prototypic loss-of-coolant accident conditions. Conclusions are presented.

2451 **(SAND—83-1829C) Ice-condenser containment loadings during severe accidents.** Behr, V.L.; Camp, A.L.; Haskin, F.E. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 16p. (CONF-8310143—22). NTIS, PC A02/MF A01. Order Number DE84002540.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

A wide range of accident scenarios for an ice-condenser containment have been analyzed using the combined capabilities of MARCH and HECTR. The results are found to be sensitive to the combustion modeling parameters. No conclusive statements can be drawn with respect to partial pre-inerting. It appears that the possible benefits afforded by a reasonably sized vent are much less than the variations in peak pressures associated with the uncertainty in some of the key modeling parameters.

2452 **(SAND—83-1851C) Core melt/coolant interactions: experiments.** Berman, M.; Evans, N.A.; Krein, M.S. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 8p. (CONF-8310143—28). NTIS, PC A02/MF A01. Order Number DE84002043.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

Experiments at Sandia have been primarily aimed at investigating core melt/coolant interaction (CMCI) phenomena associated with hypothetical accidents in light water reactors. These phenomena include steam generation (both explosive and non-explosive), hydrogen generation, and the characteristics of the resulting fuel debris. Experimental facilities have spanned a range of about 400,000:1 in fuel mass but can still be more than three orders of magnitude below possible reactor situations. The experiments have indicated that CMCI phenomena depend strongly on: molten fuel mass and composition, water/fuel mass ratio, water temperature, ambient pressure and trigger strength (when artificially triggered). As long as the fuel is molten when it contacts the water, the fuel temperature does not appear to play a major role, at least in our small-scale experiments. Water composition also appears to have a negligible effect for prototypic liquid pairs.

2453 **(SAND—83-1852C) Core melt/coolant interactions: modelling.** Berman, M.; McGlaun, J.M.; Corradini, M.L. (Sandia National Labs., Albuquerque, NM (USA); Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). 1983. Contract AC04-76DP00789. 23p. (CONF-8310143—26). NTIS, PC A02/MF A01. Order Number DE84002045.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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If there is not adequate cooling water in the core of a light-water reactor (LWR), the fission product decay heat would eventually cause the reactor fuel and cladding to melt. This could lead to slumping of the molten core materials into the lower plenum of the reactor vessel, possibly followed by failure of the vessel wall and pouring of the molten materials into the reactor cavity. When the molten core materials enter either region, there is a strong possibility of molten core contacting water. This paper focuses on analysis of recent FITS experiments, mechanistic and probabilistic model development, and the application of these models to reactor considerations.

2454 **(SAND—83-1881C) SARRP: risk rebaselining and risk reduction analysis.** Benjamin, A.S. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 23p. (CONF-8310143—29). NTIS, PC A02/MF A01. Order Number DE84002538.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

This paper presents some of the results obtained to date in the Severe Accident Risk Reduction Program and describes the analyses to be performed during the remainder of Phase 1. The following subjects are covered: (1) methodology for risk rebaselining and cost-benefit analysis, (2) treatment of uncertainties, (3) calculations of reactor financial risks, (4) cost-benefit results for selected prevention and mitigation systems, (5) procedure for generalizing plant-specific analyses, and (6) relevance of results to severe accident decision making.

2455 **(SAND—83-1890C) High pressure melt ejection.** Tarbell, W.W.; Brockmann, J.E.; Pilch, M. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 15p. (CONF-8310143—24). NTIS, PC A02/MF A01. Order Number DE84002041.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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Recent probabilistic risk assessments have identified the potential for reactor pressure vessel failure while the reactor coolant system is at elevated pressure. The analyses postulate that the blowdown of steam and hydrogen into the reactor cavity will cause the core material to be swept from the cavity region into the containment building. The High Pressure Melt Streaming (HIPS) program is an experimental study of the high pressure ejection of molten material and subsequent interactions within a concrete cavity. The program focuses on using prototypic system conditions and scaled models of reactor geometries to accurately simulate the ex-vessel processes during high-pressure accident sequences. Scaling analyses of the experiment show that the criteria established for core debris removal from the cavity are met or exceeded. Tests are performed at two scales, representing 1/10th and 1/20th linear reproductions of the Zion reactor plant. Results of the 1/20th scale tests are presented.

2456 **(SAND—83-2080C) Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program.** Kolb, G.J.; Payne, A.C. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 11p. (CONF-830901—8). NTIS, PC A02/MF A01. Order Number DE84000043.

From Anticipated and abnormal plant transients in light water reactors conference; Jackson, WY, USA (26 Sep 1983).

The Interim Reliability Evaluation Program (IREP) was designed to develop and implement improved methods of PRA systems analysis. The methods were used to analyze four plants, two PWRs and two BWRs (Arkansas Nuclear One Unit 1, Calvert Cliffs Unit 1, Browns Ferry Unit 1 and Millstone Unit 1). This paper presents a review of the methodology improvements employed in IREP as a result of problems identified in the Reactor Safety Study Methodology Application Program (RSSMAP) and other programs. Each area where improvements were made is discussed. The general subjects which are discussed are initiating events, modeling depth and systems interactions, human interactions, and data. Lastly, a comparison is made of the results of the Calvert Cliffs RSSMAP and IREP studies and examples of how each of the improvements in analysis procedures affected the PRA results are presented.

2457 **(SAND—83-2245C) Interim results of the accident sequence evaluation program (ASEP).** Harper, F.T.; Kolaczkowski, A.M.; Krantz, E. (Sandia National Labs., Albuquerque, NM (USA); EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC04-76DP00789. 3p. (CONF-8310143—32). NTIS, PC A02/MF A01. Order Number DE84002040.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

This paper highlights the interim results of ASEP. ASEP is one of many programs sponsored by the Nuclear Regulatory Commission (NRC) to study various aspects of severe core damage accidents. The results of ASEP will ultimately focus on identifying the most likely accident sequences and the high risk accident sequences for most light water reactors (LWRs). Major design and operational differences among plants will be accounted for. The factors contributing to the likelihood or risk dominance of the above sequences will also be identified.

2458 **(SAND—83-2251C) Relationship of fire protection research to plant safety.** Berry, D.L. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 34p. (CONF-8310143—31). NTIS, PC A03/MF A01. Order Number DE84002384.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

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For several years, Sandia National Laboratories has been responsible for numerous tests of fire protection systems and concepts. Tests of fire retardant cables, cable coatings, cable tray covers, penetration seals, fire barriers, and spatial separation have been reported and summarized. Other tests involving the effectiveness of suppression systems and the vulnerability of electrical cabinets have been completed with reports in preparation. The following questions constitute the central theme of current fire research by Sandia and the NRC: under what conditions is spatial separation of redundant safety systems adequate; what are the temperature, smoke, humidity, or corrosive vapor damage thresholds of cable and safety equipment exposed to fire or suppression activities; what is the safety significance of fires involving control room cabinets or remote shutdown panels; and what is the relative importance of fire to nuclear power plant safety, as compared to other types of anticipated or postulated accidents. Evidence of why these questions seem important and a description of work being undertaken to address each question are reviewed in the following paragraphs.

2459 **(SAND—83-2252C) Research on equipment survival in a hydrogen burn.** McCulloch, W.H. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 9p. (CONF-8310143—8). NTIS, PC A02/MF A01. Order Number DE84001759.

From 11. NRC water reactor safety research information meeting; Gaithersburg, MD, USA (14 Oct 1983).

Analytical activities of the HBS Program led to the inclusion of equipment survivability considerations. Analyses indicated that results are very sensitive to input assumptions, particularly the definition of the hydrogen source term. The most important experimental accomplishment has been the demonstration of the CRTF (Solar Central Receiver Test Facility) as a valid simulator of the hydrogen burn thermal environment.

2460 **Nuclear energy an unacceptable hazard to health.** Fabrikant, J.I. (Univ. of California, Berkeley). *Health Physics;* **45**: No. 3, 575-578(Sep 1983). Contract W-7405-ENG-48.

An evaluation of the health hazards of various energy sources with emphasis on nuclear energy is presented. The occupational health and safety of the employees of the energy-producing system, and the health and safety of the general public are considered. Topics discussed include low-level radiation and health effects, radiation levels and the public health, and public health problems of alternative energy sources.

2461 **Effects of the accident at Three Mile Island on the mental health and behavioral responses of the general population and nuclear workers.** Fabrikant, J.I. (Univ. of California, Berkeley). *Health Physics;* **45**: No. 3, 579-586(Sep 1983). Contract AC03-76SF00098.

The Public Health and Safety Task Force of the President's Commission on the accident at Three Mile Island concluded that the most severe health effect of the Three Mile Island nuclear accident was severe mental stress which was short-lived. This paper examines the methods of study used in assessing the mental health of the general population and nuclear workers, and the major conclusions from these studies.

2462 **BWR thermohydraulics simulation on the AD-10 peripheral processor.** Wulff, W.; Cheng, H.S.; Lekach, S.V.; Mallen, A.N. (Brookhaven National Laboratory, Upton, NY 11973). *Transactions of the American Nuclear Society;* **44**: 267-268(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2463 **Development of preliminary radionuclide mass balance for the TMI-2 accident.** Goldman, M.I.; Davis, R.J.; Shawn, L.W.; Strahl, J.F.; Tonkay, D.W. (NUS Corporation, 910 Clopper Road, Gaithersburg, MD 20878). *Transactions of the American Nuclear Society;* **44**: 211-212(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2464 **Identification of fuel debris in TMI-2 systems by gamma-ray spectroscopy.** Daniel, J.A.; Schlomer, E.A. (Science Applications, Inc., 3 Choke Cherry Road, Rockville, MD 20850). *Transactions of the American Nuclear Society;* **44**: 240-242(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2465 **PWR small-break analysis using a PDP-11/AD-10 computer system.** Venhuizen, J.R.; Hyer, F.K. (EG & G Idaho Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **44**: 271-272(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2466 **Experience reprogramming TRAC for the HEP computer.** Moore, J.W. (Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **44**: 272-273(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2467 **Post-initiating phase neutronics analysis of an unprotected LOF event in CRBR.** Turski, R.B.; Rhow, S.K. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 315-316(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2468 **Calibration and qualification of the Los Alamos failure model.** Baars, R.E. (Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **44**: 243-244(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2469 **Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient.** Liu, Y.Y. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 254-255(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2470 **A momentum integral network method for thermal-hydraulic transient analysis.** Van Tuyle, G.J. (Brookhaven National Laboratory, Upton, NY 11973). *Transactions of the American Nuclear Society;* **44**: 262-264(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2471 **(ANL-Trans—1215) Measurement of the thermal diffusivity of molten $UO_2$.** Otter, C.; Damien, D. (Argonne National Lab., IL (USA); CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. of Research on Plutonium Based Fuels). Jun 1983. Contract W-31-109-ENG-38. Translation source information not available . 16p. NTIS, PC A02/MF A01. Order Number DE84002698.

Portions are illegible in microfiche products.

The thermal diffusivity of $UO_2$ is measured above the melting point by the flash laser technique. The $UO_2$ samples were

sealed by electron beam welding in flat tungsten cells. First results confirmed the previous data of Kim and show a strong increase (by a factor of 2 or 3) in the corresponding thermal conductivity of molten $UO_2$.

2472 **Adjoint sensitivity analysis of extremum-type responses in reactor safety.** Cacuci, D.G.; Maudlin, P.J.; Parks, C.V. (Oak Ridge National Laboratory, Engineering Physics Division, P.O. Box X, Oak Ridge, Tennessee 37830). *Nuclear Science and Engineering;* **83**: No. 1, 112-135(Jan 1983).

A recently developed sensitivity theory for nonlinear systems with responses defined at critical points, e.g., maxima, minima, or saddle points, of a function of the system's state variables and parameters is applied to a protected transient with scram on high-power level in the Fast Flux Test Facility. The single-phase segment of the fast reactor safety code MELT-IIIB is used to model this transient. Two responses of practical importance, namely, the maximum fuel temperature in the hot channel and the maximum normalized reactor power level, are considered. For the purposes of sensitivity analysis, a complete characterization of such responses requires consideration of both the numerical value of the response at the maximum, and the location in phase space where the maximum occurs.

2473 **Nuclear facility threat analysis and tactical-response procedures.** Cadwell, J.J. Springfield, IL; Charles C. Thomas Publisher (1983). 112p. Charles C. Thomas, Publisher, 2600 South First Street, Springfield, IL 62717.

Reports originally submitted to the US Nuclear Regulatory Commission by the Brookhaven National Laboratory are compiled to aid in the management of a nuclear facility security force. The book will help in training guards, making practical alarm assessment, and providing model response procedures and information that can be used to implement security plans as required in Part 10 of the US Code of Federal Regulations and Part 73.55 Appendix C. The security recommendations address the potential threat posed by terrorist actions that may lead to the sabotage of a nuclear facility. 33 references, 27 figures.

2474 **Radiation protection technology transfer for overseas nuclear power stations.** O'Hara, J.C. (Ebasco Services Inc., 2 World Trade Center, New York, NY 10048). *Transactions of the American Nuclear Society;* **42**: 111-113(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2475 **Nuclear customer services.** Bohmann, W.E. (Brown Boveri/FRG, Brown Boveri Reaktor GmbH, Postfach 5143, D-6800, Mannheim 1). *Transactions of the American Nuclear Society;* **42**: 113-114(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2476 **A functional system definition for operations, testing, and training.** Sommer, W.C.; Rackley, J. (Burns & Roe, Inc., 650 Winters Avenue, Paramus, NJ 07675). *Transactions of the American Nuclear Society;* **42**: 114-117(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2477 **Experience that contribute to operation and maintenance technology transfer.** Suzuki, N.; Higashi, A.; Kagayama, T. (The Japan Atomic Power Co., 6-1 Ohtemachi, 1-chome, Chiyoda-ku, Tokyo 100). *Transactions of the American Nuclear Society;* **42**: 118-119(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2478 **Experience in transfer of BWR maintenance technology.** Felmus, N.L. (General Electric Company, Nuclear Energy Division, 175 Curtner Avenue, San Jose, CA 95125). *Transactions of the American Nuclear Society;* **42**: 124-125(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2479 **Maintenance experience in Spain.** Cereceda, M.; Izquierdo, J. (TECNATOM/Spain, Km. 19 C.N.I., Madrid-Irun, S.S. de Los Reyes, Madrid). *Transactions of the American Nuclear Society;* **42**: 126-128(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2480 **Education-prerequisite to adequate technology transfer.** Wallis, L.R. (General Electric Company, Nuclear Energy Division, 175 Curtner Avenue, San Jose, CA 95125). *Transactions of the American Nuclear Society;* **42**: 141-142(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2481 **Transfer of science, education, and basic nuclear technology.** Bain, A.S.; Rae, H.K. (Atomic Energy of Canada Limited, Chalk River Nuclear Laboratories, Chalk River, Ontario K0J 1J0). *Transactions of the American Nuclear Society;* **42**: 142-143(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2482 **Training of technicians in the nuclear field: university/industry collaboration.** Pascual, L.G. (ICAI/SPAIN). *Transactions of the American Nuclear Society;* **42**: 143-144(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2483 **The program of cooperation between the King Abdulaziz University and the Swiss Federal Institute of Technology in the field of nuclear education and training.** Schneeberger, J.P.; Jamjoom, M.M.O.; Majid, S.A.; Sahin, S. (Ecole Polytechnique Federale de Lausanne, Institut de Genie Atomique, CH-1015 Lausanne). *Transactions of the American Nuclear Society;* **42**: 145-146(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2484 **Simulator training for nuclear power plant operation in Brazil.** Spitalnik, J.; Hurley, F.I. (NUCLEBRAS/Brazil, Av. President Wilson, 231 Sala-608, Castelo, 20030, Rio de Janeiro, JF). *Transactions of the American Nuclear Society;* **42**: 146-148(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2485 **Transfer of educational programs to the nuclear utility industry.** Diaz, N.J.; Dugan, E.T.; Vernetson, W.G. (Florida Nucl. Assoc./USA, Florida Nuclear Associates, 2284 NW 19th Lane, Gainesville, FL 32605). *Transactions of the American Nuclear Society;* **42**: 148-151(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2486 **An assessment of the radiological consequences of postulated reactor accidents.** Warman, E.A.; Bergeron, C.F.; Vanasse, R.E. (Stone & Webster Engineering Corporation, P.O. Box 2325, 245 Summer Street, Boston, MA 02107). *Transactions of the American Nuclear Society;* **42**: 157-158(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2487 **International exchange of knowledge with regard to safety.** Tanguy, P. (CEA/France, Commissariat a l'Energie Atomique, 31-33 Rue de la Federation, 75015, Paris). *Transactions of the American Nuclear Society;* **42**: 158(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2488 **National and international standards in nuclear technology transfer.** Becker, K. (DIN/FRG, DIN Deutsches Institut fur Normung EV, Postfach 1107, 1000, Berlin, 30). *Transactions of the American Nuclear Society;* **42**: 163-164(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2489 **Standardization and nuclear independence.** Rapin, M.; Pellerin, J. (CEA/France, Commissariat a l'Energie Atomique, 31-33 Rue de la Federation, 75015, Paris). *Transactions of the American Nuclear Society;* **42**: 164-165(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2490 **IRAM toward standardization in the nuclear field.** Tychojkij, J. (IRAM/Argentina, Chile 1 192, 1 098 Capital Federal, Buenos Aires). *Transactions of the American Nuclear Society;* **42**: 165-166(Nov 1982). (CONF-821104—).

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

2491 **A comparison study of Response Surface Methodology and Differential Sensitivity Theory in core disruptive accident analysis.** Morris, E.E.; Mueller, C.J.; Cahalan, J.E.; Komoriya, H. (Argonne National Lab., IL). pp 953-964 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Response Surface Methodology (RSM) and Differential Sensitivity Theory (DST) are compared in an application to a loss-of-decay-heat-removal accident in a gas-cooled fast reactor. The objective is to obtain an indication of their relative capabilities in uncertainty propagation and probabilistic analysis in reactor safety as well as their implementation and development costs. Quantitative comparisons are made to examine the effects of non-linearities as well as the completeness and flexibility of the methods. The applicability of each method for different phases of degraded core analysis is discussed.

2492 **Variance reduction in simulation.** Strip, D.; Diegert, K.V. (Sandia National Lab., Albuquerque, NM). pp 965-972 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Any simulation code which samples from distributions of random variables is logically equivalent to a statistical experiment, and its outputs must be interpreted in the framework of statistics. The use of random events in the code means that the results are statistical estimates, and therefore are subject to variability. It is often important to minimize the variance of these estimates in order to maximize the utility of the results. Simulation professionals and statisticians have devoted considerable effort to the development of tools for this purpose. This paper discusses a number of these variance reduction techniques in the context of their potential or actual application in models used for probabilistic risk assessment.

2493 **Development and organization of the industry/NRC procedures guide.** Hickman, J.W. (Sandia National Lab., Albuquerque, NM). pp 1491-1500 of Probabilistic risk assessment. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

The preparation of the Industry/NRC Procedures Guide is being carried out by a Technical Writing Group (TWG) comprised of individuals with a wide range of Probabilistic Risk Assessment (PRA) expertise. They were selected either on the basis of their expertise in the disciplines required in probabilistic risk assessment or their affiliation with major risk assessments underway. In this paper, the program plan under which the TWG is working is described. This will include the composition of the TWG, the mechanism provided for broad peer review, and the organization of the procedures guide.

2494 **Organization for the performance of PRA programs.** Carlson, D.D. (Sandia National Lab., Albuquerque, NM); Heising-Goodman, C.D. pp 1501-1510 of Probabilistic risk assessment. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

A joint industry/NRC effort is currently underway to develop a procedures guide for performing probabilistic risk assessments (PRA) of nuclear power plants. Chapter 2 of the guide deals with the organization of the PRA. Four levels of scope for PRAs are defined. The methodology for performing the analysis is discussed in general, providing an overview of the tasks involved and the relationships among the various tasks. Management of the analysis, including means for helping to assure a quality analysis, is also discussed. Manpower and schedule estimates are provided for the information of organizations considering undertaking probabilistic risk assessments of varying scopes. The estimates reflect the performance of a PRA using the procedures contained in the guide.

2495 **Development of a data base for quantification of accident sequences.** Leverenz, F.L. Jr. (Battelle, Columbus, OH). pp 1520-1526 of Probabilistic risk assessment. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

A separate chapter in the Industry/NRC PRA Procedures Guide is devoted to developing a data base. The procedures in this chapter will include data collection, data analysis, and application of the data to specific events in the logic models. This chapter, together with the chapter on human reliability, couples logic model development to sequence quantification.

2496 **Fission product behavior and containment response models for use in PRA studies.** Denning, R.S. (Battelle, Columbus, OH); Baybutt, P.; Morewitz, H. pp 1544-1553 of Probabilistic risk assessment. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

The status of the development of a procedures guide for the analysis of in-containment aspects of degraded core accidents is described. In the Procedures Guide for Probabilistic Risk Assessment, the physical processes that must be modeled in severe core damage accidents are described. These include fuel heatup and slumping, clad oxidation, hydrogen burning, and containment failure modes. Existing computer codes that analyze these processes are discussed. Similarly, a description is provided of the physical and chemical processes that control the release, transport, and escape of radionuclides from the reactor coolant system and containment building. Available computer codes that describe these processes also are discussed. Comments are provided regarding the magnitude of uncertainties in the analyses and the limitations in the applicability of the computer codes.

2497 **Insights from the Arkansas Nuclear One (ANO) unit one IREP analysis.** Kolb, G.J. (Sandia National Lab., Albuquerque, NM). pp 521-527 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

The IREP ANO One analysis is nearing completion. This paper describes the ANO study, technical problems encountered in the analysis, and some qualitative insights gained from the study to date.

2498 **Systemic event tree methodolgoy employed in the Interim Reliability Evaluation Program (IREP).** Kolb, G.J. (Sandia National Lab., Albuquerque, NM). pp 558-567 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

This paper summarizes the systemic event tree methodology employed in the IREP. The analysis steps required to construct a set of event trees which model core meltdown accident sequences initiated by a variety of LOCA and transient initiating events are discussed. Analysis of the emergency procedures the plant operators follow during a given accident sequence is also discussed.

2499 **Fault tree analysis using modular logic models.** Varnado, G.B. (Sandia National Lab., Albuquerque, NM); Horton, W.; Lobner, P. pp 568-576 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Nuclear power plants have many features in common. The functions and configuration of safety systems, and the types of components used in the systems are similar for different plants. We developed modular logic models to represent the fundamental fault logic for many commonly occurring nuclear power plant features. We further defined procedures to guide the fault tree analyst through the process of altering and connecting appropriate modular logic models to build detailed fault trees for specific systems. An interactive computer system is used to assemble and alter the modular logic models. This paper discusses the modular logic approach to fault tree analysis and describes the tools currently available to support the approach.

2500 **Interim reliability evaluation program: Browns Ferry fault trees.** Stewart, M.E. (EG & G Idaho, Inc., Idaho Falls). pp 577-586 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

An abbreviated fault tree method is used to evaluate and model Browns Ferry systems in the Interim Reliability Evaluation Programs, simplifying the recording and displaying of events, yet maintaining the system of identifying faults. The level of investigation is not changed. The analytical thought process inherent in the conventional method is not compromised. But the abbreviated method takes less time, and the fault modes are much more visible.

2501 **IREP human reliability analysis.** Bell, B.J.; Carlson, D.D. (Sandia National Lab., Albuquerque, NM). pp 587-596 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Human reliability analyses were performed as part of the several probabilistic risk assessments of the Interim Reliability Evaluation Program. The relationship of these human reliability analyses to other elements of the risk assessments is discussed here, along with a description of the modeling of the effects of human error into the system fault trees. The initial screening of the system for sites of inclusion in the system models of estimates of the effects of human errors are made by the system analysts. They then pinpoint specific components or specific plant procedural steps for which human errors would result in system degradation. The human reliability analysts then identify and quantify the effects of possible human errors for inclusion in the human error contribution blocks of the system fault trees.

2502 **Accident sequence evaluation for IREP.** Stack, D.W. (Sandia National Lab., Albuquerque, NM). pp 597-605 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

The inputs to the accident sequence evaluation include the system fault tree models and the event tree models. Each event tree sequence defines a unique accident sequence. The qualitative analysis of an accident sequence is concerned with determining the minimal cut sets of the accident sequence. The quantitative analysis deals with computing a probability estimate for the minimal cut sets of the accident sequence and a frequency for the accident sequence. Each accident sequence is modeled by an event tree sequence which consists of an initiating event and the subsequent failure or success of one or more of the front line safety systems. The system failure or success states represent the status of the safety systems at the time the initiating event occurs. The failure or success of a safety system is modeled by a fault tree or its complement. The fault tree primary events have associated unavailabilities or failure probabilities.

2503 **On issues important to the development of a systems interaction evaluation procedure.** Lim, J.J. (EDS Nuclear, Inc., Walnut Creek, CA); Alesso, H.P. pp 633-639 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Recent events such as Three Mile Island-2, Brown's Ferry-3 and Crystal River-3 have demonstrated that complex accidents can occur as a result of dependent (common cause/mode) failures. Types of events such as these are now being called Systems Interactions. A procedure for the identification and evaluation of Systems Interactions caused by dependent failures is being developed by the NRC. Several national laboratories and utilities have contributed preliminary procedures. As a result, several important aspects of the System Interaction problem have been highlighted. This paper will discuss several of these issues critical to the development of a Systems Interaction analysis procedure.

2504 **Probabilistic methods for accident progression analysis.** Jamali, K. (Brookhaven National Lab., Upton, NY); Kerr, W. pp 649-658 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Probabilistic methods that can be used as basis for deterministic calculations of transients or accidents in nuclear power plants are described. They include obtaining initiator-dependent sequences on the component level and related analyses, propagation of primary event uncertainties in the ranking of sequences, and consistent treatment of dependent failures. The results are shown for protected transients in the short term forced circulation phase of decay heat removal in the Clinch River Breeder Reactor. Higher values of unavailabilities are obtained than previous works as a result of higher contributions from common cause/mode failures. The probabilities of failure of decay heat removal by forced circulation for loss of off-site power and for loss of main feedwater system initiators are estimated at $9 \times 10^{-3}$/yr and $1.4 \times 10^{-3}$/yr, respectively.

2505 **Common cause failure rate estimates for diesel generators in nuclear power plants.** Steverson, J.A.; Atwood, C.L. (EG & G Idaho, Inc., Idaho Falls). pp 659-665 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—). Contract AC07-76ID01570.

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Common cause fault rates for diesel generators in nuclear power plants are estimated, using Licensee Event Reports for the years 1976 through 1978. The binomial failure rate method, used for obtaining the estimates, is briefly explained. Issues discussed include correct classification of common cause events, grouping of the events into homogeneous data subsets, and dealing with plant-to-plant variation.

2506 **Structures for common-cause failure analysis.** Vaurio, J.K. (Argonne National Lab., IL). pp 676-685 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Common-cause failure methodology and terminology have been reviewed and structured to provide a systematical basis for addressing and developing models and methods for quantification. The structure is based on (1) a specific set of definitions, (2) categories based on the way faults are attributable to a common cause, and (3) classes based on the time of entry and time of elimination of the faults. The failure events are then characterized by their likelihood or frequency and the average residence time. The structure provides a basis for selecting computational models, collecting and evaluating data and assessing the importance of various failure types, and for developing effective defences against common-cause failures. Relationships to other structures are described.

2507 **Availability analysis of standby safety systems.** Vaurio, J.K. (Argonne National Lab., IL). pp 707-716 of Probabilistic risk assessment. Volume III. La Grange Park, IL; American Nuclear Society, Inc. (1982). (CONF-810905—).

From ANS/ENS topical meeting on probabilistic risk assessment; Port Chester, NY, USA (20 Sep 1981).

Comprehensive availability models have been developed for analyzing redundant standby safety systems. Both periodic inspections and continuous monitoring have been included as means of discovering failures. Human errors associated with testing, monitoring and repair have been incorporated as well as spurious alarms, and failures after a demand during the mission time. Equations have been developed for calculating optimum inspection intervals and average steady-state availabilities of standby m-out-of-n:G systems, with several schemes of staggering the tests. Techniques for including undetected and common-cause failures have been developed. Generic conclusions have been drawn about the importance of monitoring to detect errors made in testing and returning components to service after maintenance. Numerical examples which are representative of safety systems in nuclear power plant applications are presented.

2508 **Results of SIMMER-II analysis of fuel migration through the gap between internal fuel element clusters in heterogeneous cores.** Royl, P. Karlsruhe, Germany; Fachinformationszentrum Energie, Physik, Mathematik (1982). 1p. (In German). Available form Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

From Seminar on reactor technology; Karlsruhe (Germany, F.R.) (2 Dec 1982).

2509 **American National Standard: security for nuclear power plants.** La Grange Park, IL; American Nuclear Society (1982). 22p. (ANSI/ANS—3.3-1982). American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525 $20.00.

This standard provides criteria, requirements and guidance for development of physical security plans for protection of operational nuclear power plants against acts of radiological sabotage. Owner organizations may have other strong incentives for protection of nuclear power plants, such as the protection of employees, the large capital investment involved, and the preservation of reliable power sources. Although other incentives are recognized as having significant impact on the preparation of an overall security program, and may derive collateral support from the provisions of this standard, they were not considered explicitly in the preparation of this standard. The criteria provided in this standard are intended to be consistent with applicable federal regulations.

2510 **American National Standard: criteria and guidelines for assessing capability for surface faulting at nuclear power plant sites.** La Grange Park, IL; American Nuclear Society (1982). 14p. (ANSI/ANS—2.7-1982). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $16.00.

This standard provides applicants and consultants with criteria and guidelines for investigations directed toward the assessment of the capability for surface faulting at nuclear power plant sites. Assessment of vibratory ground motion resulting from faulting is not treated in these guidelines.

2511 **American National Standard: for decommissioning of research reactors.** La Grange Park, IL; American Nuclear Society (1981). 19p. (ANSI/ANS—15.10-1981). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $18.00.

This standard provides requirements and guidance for the decommissioning of research reactors and includes decommissioning alternatives, planning, radiation criteria, surveillance and maintenance, environmental impacts, quality assurance, and reports and documentation.

2512 **American National Standard: program for testing radiation shields in light-water reactors (LWR).** La Grange Park, IL; American Nuclear Society (1980). 22p. (ANSI/ANS—6.3.1-1980). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $20.00.

This standard describes a test program to be used in evaluating all biological radiation shielding in nuclear reactor facilities under normal operating conditions including anticipated operational occurrences. The program encompasses examining and testing to be performed before startup, and testing subsequent to the startup phase. Post startup tests are required for the shielded components which do not contain sufficient radioactivity during the startup phase to allow valid testing. Shielding of these components is to be tested when radiation sources develop or are introduced in sufficient strength to allow meaningful measurements. Post startup shield tests are also required whenever radioactive or potentially radioactive equipment which could affect the adequacy of the installed shielding is introduced into the plant or relocated within the plant, or when previously tested shielding has been modified. One special category of post startup testing is the testing of shielding during refueling operations.

2513 **Fast breeder reactor at Kalkar. Pt. 2. Uncalculable risk - intolerable risk. Law suit going on.** Degen, G. (ed.). Karlsruhe, Germany, F.R.; Fachinformationszentrum Energie, Physik, Mathematik (1979). 25p. (In German).

After a brief description of the previous development of the case the legal decisions are documented and commented on. The concept of the then FDP-Minister of Economy of North Rhine Westphalia (Riemer, Pu-combustion plant) is presented and the prospects and risk for the fast breeder reactor after the 3. partial construction license are discussed. (orig./HP).

2514 **American National Standard: for safety-related cooling water systems in nuclear power plants.** La Grange Park, IL; American Nuclear Society (1979). 17p. (ANSI/ANS—59.1-1979). American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525 $20.00.

This standard presents the basic requirements of the Safety Related Cooling Water Systems (SRCWS). It establishes minimum safety requirements in design, materials, fabrication, location and surveillance of components. The SRCWS in light water reactor and

gas-cooled nuclear power plants performs the safety functions stated in the system safety functions.

2515 **American National Standard: criteria for technical specifications for nuclear power stations.** La Grange Park, IL; American Nuclear Society (1979). 25p. (ANSI/ANS—58.4-1979). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $24.00.

This standard applies to the preparation of technical specifications required by Title 10, Code of Federal Regulations, Part 50, Licensing of Production Facilities, Section 50.36, Technical Specifications for all nuclear power plants and provides the following: (1) A detailed conceptual framework which can be applied to the preparation of technical specifications. (2) Criteria for selecting subjects and values to be included in the technical specifications. (3) Criteria for developing technical specification bases.

2516 **Safety and licensing issues that are being addressed by the Power Burst Facility test programs.** (EG & G Idaho, Inc., Idaho Falls). pp 18 of CSNI specialist meeting on safety aspects on fuel behaviour in off-normal and accident conditions. McCardell, R.K.; MacDonald, P.E. Helsinki, Finland; CSNI ([nd]). Contract AC07-76ID01570.

From CSNI Specialist Meeting on Safety Aspects of Fuel Behaviour in Off-Normal and Accident Conditions; Helsinki, Finland (1 Sep 1980).

This paper presents an overview of the results of the experimental program being conducted in the Power Burst Facility and the relationship of these results to certain safety and licensing issues. The safety issues that were addressed by the Power-Cooling-Mismatch, Reactivity Initiated Accident, and Loss-of-Coolant Accident Test Series, which comprised the original test program in the Power Burst Facility, are discussed. The resolution of these safety issues, on the basis of the results of the thirty-six tests performed to date, is presented. The future resolution of safety issues identified in the new Power Burst Facility test program, which consists of tests that simulate boiling water reactor and pressurized water reactor operational transients, anticipated transients without scram, and severe fuel damage accidents, is described.

# 25 ENERGY STORAGE

## 2506 Thermal

*REFER ALSO TO CITATION(S) 2614, 2626*

2517 **(EUR—8539-FR) Study of storage in a captive aquifer used as a geothermal reservoir. Final report.** Depois, J.; Clamens, H. (CEA, 75 - Paris (France); Societe Nationale ELF-Aquitaine, 75 - Paris (France)). 1983. 308p. (In French). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

Studies to establish the feasibility of underground heat storage (180 to 200°C) in captive ground water encountered at depths greater than 200 meters. To demonstrate the feasibility of this type of heat storage, a site has been selected, at Thiverval-Grignon, near Plaisir, a town in the suburbs of Paris. An exploratory well has been drilled in 1980 on the site of household waste incineration plant and equipped at a depth of 508 m in the Weald aquifer, selected for the demonstration phase. This well has permitted to know important data concerning the hydrogeological and geochemical behavior of the aquifer. By introducing these data in numerical models, the feasibility of the selected underground heat storage has been confirmed.

2518 **(N—8325048) Heat storage in rock: Multiple well system.** Andersson, S.; Eriksson, A.; Nordell, B. (Luleaa Univ., (Sweden)). 1982. 15p. (CONF-811066—; TULEA—1981:28; PNL-SA—10347-Vol.1; PNL-SA—10347-Vol.2). NTIS, PC A02/MF A01.

From International energy storage conference; Seattle, WA, USA (19 Oct 1981).

The multiple well heat storage system is primarily a seasonal storage. Its function is based on the heat conductivity and storage capacity properties of the rock. The heat is transferred to, or from, the rock by means of a fluid, normally water, which is circulated through a great number of boreholes or wells.

2519 **(N—8325079) Mathematical modeling of TES subsystems.** Solomon, A.D. (Oak Ridge National Lab., TN (USA)). Feb 1982. 3p. NTIS, PC A17/MF A01.

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 239-241 (SEE N83-25057 14-44).

Results of research into phase change models for latent heat storage are described. These are of both a simulation and analytical nature and continue the work of past years in this effort.

2520 **(N—8325091) High temperature active heat exchanger research for latent heat storage.** Alario, J.; Haslett, R. (Grumman Aerospace Corp., Bethpage, NY (USA)). Feb 1982. 6p. (CONF-810940—). NTIS, PC A17/MF A01.

From Annual contractors' review meeting on thermal and chemical storage; Tysons Corner, VA, USA (16 Sep 1981).

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 377-382 (SEE N83-25057 14-44).

An active heat exchange method in a latent heat (salt) thermal energy storage system that prevents a low conductivity solid salt layer from forming on heat transfer surfaces was developed. An evaluation of suitable media with melting points in the temperature range of interest (250 to 400 C) limited the candidates to molten salts from the chloride, hydroxide and nitrate families, based on high storage capacity, good corrosion characteristics and availability in large quantities at reasonable cost. The specific salt recommended for laboratory tests was a choride eutectic (20.5KCL o 24.5NaCL o 55.MgCl2% by wt.), with a nominal melting point of 385 C. Various active heat exchange concepts were given a technical and economic comparison to a passive tube shell design for a reference application (300 MW sub t for 6 hours). Test hardware was then built for the most promising concept: a direct contact heat exchanger in which molten salt droplets are injected into a cooler counter flowing stream of liquid metal carrier fluid (lead/Bismuth).

2521 **(ORNL/TM—8840) Research opportunities in salt hydrates for thermal energy storage.** Braunstein, J. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 61p. NTIS, PC A04/MF A01. Order Number DE84002977.

The purpose of this document is to review the state-of-the-art of salt hydrates as phase change materials for low temperature thermal energy storage, with the objective of recommending research that would result in more practicable use of these materials. Areas for review included phase equilibria, nucleation behavior and melting kinetics of the commonly used hydrates. A great deal of effort has been expended over the past thirty years towards the development of efficient, reliable inexpensive systems based on phase change materials, especially salt hydrates, for the storage (and retrieval) of thermal energy for residential heating. Although some commercial development is now occurring, the use of phase change material thermal energy storage systems is not yet widespread, in part because solution of the problem of long term reliability has been elusive. Additional basic research is needed in the areas of crystallization and melting kinetics, prediction of phase behavior in ternary systems, thermal diffusion in salt hydrate systems, and in the physical properties pertinent to nonequilibrium as well as equilibrium transformations in these systems.

2522 **Aquifer thermal energy storage: a well doublet experiment at increased temperatures.** Molz, F.J.; Melville, J.G.; Parr, A.D.; King, D.A.; Hopf, M.T. (Auburn Univ., AL). *Water Resources Research;* **19**: No. 1, 149-160(Feb 1983).

The two main objectives of this communication are to present a study of potential advantages and disadvantages of the doublet supply-injection well configuration in an aquifer thermal energy storage (ATES) system and to report on aquifer storage problems with injection temperatures in the 80°C range. A 3-month injection-storage-recovery cycle followed by a 7.3-month cycle constituted the main experiment. The injection volumes were 25,402 $m^3$ and 58,063 $m^3$ at average temperatures of 58.5°C and 81°C respectively. Unlikely previous experiments at the Mobile

site, no clogging of the injection well due to clay particle swelling, dispersion, and migration was observed. This is attributed to the fact that the supply water used for injection contained a cation concentration equal to or slightly greater than that in the native groundwater. For cycles I and II, the fraction of injected energy recovered in a volume of water euqal to the injection volume was 0.56 and 0.45 respectively. Both groundwater temperature and tracer data support the conclusion that this relatively low recovery was due to the detrimental effects of free thermal convection, possibly augmented by longitudinal zones of high permeability. Construction of a partially penetrating recovery well improved recovery efficiency but is not thought to be an adequate solution to thermal stratification. A maximum increase of 1.24 cm in relative land surface elevation was recorded near the end of second cycle injection. The engineering implications of such an elevation change would have to be considered, especially if an ATES system were being designed in an urban environment. A third cycle is expected to maximize energy recovery from a thermally stratified storage aquifer.

## 2508 Chemical

*REFER ALSO TO CITATION(S) 3030*

## 2509 Batteries

2523 **(AD-A—130879/0) Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82.** Smith, P.H.; DeVries, L.; Shih, J.N.; James, S.D.; Kilroy, W.P. (Naval Surface Weapons Center, Silver Spring, MD (USA)). May 1983. 28p. NTIS, PC A03/MF A01.

This investigation re-examines the possible undervoltage electrochemical formulation of Li-C intercalation compounds. The conditions simulated that of a cell which has failed due to depolarizer starvation. Carbon black cathodes were subjected to constant-current electrolysis in 1 M LiAsF solutions in propylene carbonate or 2-methyltetrahydrofuran. Cathode V-t curves displayed plateaus around + 1 V versus Li in which the cathode absorbed approximately 16 coulombs per sq cm before falling to 0.05 V where the runs were terminated. Aqueous extracts of the cathodes contained little or no hydroxide indicating the absence of Li-C compounds. However, the present work also showed that LiC6 rapidly reduces propylene carbonate to carbonate ion. Hence it remains possible that the undervoltage plateaus originated in the formation of intermediate Li-C compounds which rapidly reduce the solvent.

2524 **(DOE/ER/10597—2) High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983.** Farrington, G.C. (Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering). 1983. Contract AC02-80ER10597. 9p. NTIS, PC A02/MF A01. Order Number DE84002438.

Research progress is reported in efforts: 1. to prepare crystals of the protonic beta" aluminas large enough for neutron diffraction and tracer diffusion studies; 2. to determine whether different growth conditions for sodium beta" alumina crystals influence the characteristics of the protonic beta" aluminas derived from them; 3. to analyze the stability and conductivity of hydronium beta" alumina from 20 to 450°C; 4. to begin isotope diffusion studies to probe the conduction mechanisms in these materials; 5. to carry out and analyze the first of an integrated series of structure determinations by neutron diffraction.

2525 **(DOE/NASA/0250—1) Study to establish cost projections for production of redox chemicals.** Walther, J.F.; Greco, C.C.; Rusinko, R.N.; Wadsworth, A.L. III. (Allied Chemical Co., Solvay, NY (USA). Syracuse Research Lab.). Nov 1982. Contract AI04-80AL12726. 37p. (NASA-CR—167881). NTIS, PC A03/MF A01. Order Number DE84002143.

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A cost study of four proposed manufacturing processes for redox chemicals for the NASA REDOX Energy Storage System yielded favorable selling prices in the range $0.99 to $1.91/kg of chromic chloride, anhydrous basis, including ferrous chloride. The prices corresponded to specific energy storage costs from under $9 to $17/kWh. A refined and expanded cost analysis of the most favored process yielded a price estimate corresponding to a storage cost of $11/kWh. The findings supported the potential economic viability of the NASA REDOX system.

2526 **(LBL—16523) Rechargeability of the zinc electrode in alkaline electrolyte.** Nichols, J.T.; McLarnon, F.R.; Cairns, E.J. (Lawrence Berkeley Lab., CA (USA)). Sep 1982. Contract AC03-76SF00098. 12p. (CONF-8209192—1). NTIS, PC A02/MF A01. Order Number DE84000167.

From International Society of Electrochemistry meeting; Lyon, France (6 Sep 1982).

The rechargeability and cycle-life performance of model Zn/NiOOH cells was investigated. Electrolytes that exhibit reduced solubility of ZnO demonstrated improved capacity retention and lower rates of Zn material redistribution after approximately 128 constant current cycles. KOH + KF and KOH + $H_3BO_3$ electrolytes showed the best performance.

2527 **(N—8325038) Cycle life test and failure model of nickel-hydrogen cells.** Smithrick, J.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1983. 16p. (NASA-TM—83375; E—1643). NTIS, PC A02/MF A01.

Six ampere hour individual pressure vessel nickel hydrogen cells were charge/discharge cycled to failure. Failure as used here is defined to occur when the end of discharge voltage is degraded to 0.9 volts. They were cycled under a low earth orbit cycle regime to a deep depth of discharge (80 percent of rated ampere hour capacity). Both cell designs were fabricated by the same manufacturer and represent current state of the art. A failure model was advanced which suggests both cell designs have inadequate volume tolerance characteristics. The limited existing data base at a deep depth of discharge (DOD) was expanded. Two cells of each design were cycled. One COMSAT cell failed at cycle 1712 and the other failed at cycle 1875. For the Air Force/Hughes cells, one cell failed at cycle 2250 and the other failed at cycle 2638. All cells, of both designs, failed due to low end of discharge voltage (0.9 volts). No cell failed due to electrical shorts. After cell failure, three different reconditioning tests (deep discharge, physical reorientation, and open circuit voltage stand) were conducted on all cells of each design. A fourth reconditioning test (electrolyte addition) was conducted on one cell of each design. In addition post cycle cell teardown and failure analysis were performed on the one cell of each design which did not have electrolyte added after failure.

2528 **(N—8325045) Report for 1981 on research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion.** (Exide Management and Technology Co., Yardley, PA (USA)). Mar 1982. 85p. NTIS, PC A05/MF A01.

Life testing of a 300 Ah cell was continued using the high rate dc charge and deep discharge at C/3 (100%). To date the cell has completed over 350 cycles, and capacity is still at 90% of nominal level. The four-cell 300 Ah module which was submitted to NBTL for testing failed prematurely because of a hydrogen explosion. This was originally thought to be caused by a material failure, but later testing indicated that a spark caused by a loose nodule of zinc was the cause of failure. A fix for this condition was effected, and no recurrence of this type of failure were seen. Experiments with electrolyte concetration were continued, and extended cycling (over 300 cycles) with higher concentrations of KOH (9M, 10M) resulted in higher capacities over an extended period. Experimental baseline modules (2-cell) based on the EV-106 lead-acid battery footprint and incorporating 1.5 mm interelectrode spacing were built and tested.

2529 **(UCRL—15549) Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983.** Tryk, D.; Aldred, W.; Yeager, E. (Case Western Reserve Univ., Cleveland, OH (USA). Case Center for Electrochemical Sciences). 15 Jul 1983. Contract W-7405-ENG-48. 105p. NTIS, PC A06/MF A01. Order Number DE84002774.

The major objective of this research has been to identify high efficiency, long-life electrocatalysts for $O_2$ reduction and generation for use in bifunctional electrodes in alkaline electrolytes. The Westinghouse bifunctional electrode uses separate catalysts for reduction and generation, each of which is stable in the opposite mode. Reduction takes place on carbon, with peroxide elimination by silver, and $O_2$ generation takes place on a hydrated Ni-Fe oxide which forms during cycling. The catalysis and aging phenomena in the electrode have been examined in order to gain an understanding of a state-of-the-art system and then to optimize it. New electrochemical characterization techniques are used, including a porous coated rotating disk electrode technique. A large number of catalysts has been examined with these techniques, together with standard polarization measurements on gas-fed electrodes. (LEW)

2530 **Rapidly refuelable fuel cell.** Joy, R.W. (to Dept. of Energy). US Patent 4,389,466. 21 Jun 1983. Filed date 3 Jun 1981. vp.

PAT-APPL-270113.

This invention is directed to a metal-air fuel cell where the consumable metal anode is movably positioned in the cell and an expandable enclosure, or bladder, is used to press the anode into contact with separating spacers between the cell electrodes. The bladder may be depressurized to allow replacement of the anode when consumed.

2531 **New lead-acid battery designed by Sandia National Laboratories.** (Sandia National Lab., Albuquerque, NM). *Sea Technology;* **24**: No. 2, 46-47(Feb 1983).

A sealed, maintenance-free lead-acid battery designed to store energy collected by solar cells is undergoing proof-testing at Sandia National Laboratories, Albuquerque, New Mexico.

2532 **Impurities and solid electrolyte failure.** De Jonghe, L.C. (Lawrence Berkeley Lab., CA). *Solid State Ionics;* **7**: 61-64(1982). Contract W-7405-ENG-48.

A thermodynamically based model is used to assess the effects of the formation of a layer of lowered ionic conductivity and increased electronic conductivity on the applied voltage at which solid electrolyte failure is to be expected. Such a layer can result from electrolyte contamination with electrode impurities. It is found that when a significant electrolyte resistivity increase is produced, electrolyte failure can be initiated by a mechanism that deposits sodium internally in the solid electrolyte. The results stress the necessity of operating solid electrolyte cells, such as Na/S, in a manner than minimizes electrode contamination.

# 29 ENERGY PLANNING AND POLICY

2533 **(GAO/GGD—83-7) Legislation needed to improve administration of tax exemption provisions for electric cooperatives.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 5 Jan 1983. 105p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Report to the Congress.

Since electric cooperatives were first granted tax exemption in 1924, many of them have grown and changed. IRS has tried to recognize the wide diversity among electric cooperatives when administering tax exemption provisions. However, it has had difficulty doing so because of broad legislation which generally exempts all such cooperatives from paying taxes regardless of differences in their operations and activities, financial condition, size, or mix of consumers served. GAO recommends administrative changes so that IRS can more effectively enforce existing tax exemption provisions. More importantly, GAO recommends that the Congress, using GAO's suggested alternatives as a guide, adopt a tax treatment which better recognizes the changing operations and present day environment of many electric cooperatives and their continuing need for assistance.

2534 **(GAO/PLRD—83-70) Questionable practices in the selection of transportation services for small lots of hazardous or sensitive cargo.** (General Accounting Office, Washington, DC (USA). Procurement, Logistics, and Readiness Div.). 31 May 1983. 27p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Report to the Secretary of Defense.

The Department of Defense spends several million dollars a year to transport small lots of hazardous or sensitive cargo. Truck and air taxi operators actively compete for this cargo. Despite the similarities in the truck and air taxi prices and service, DOD routed far more cargo to trucks than to air taxis. Also, more business was routed to one air taxi than to the others. Consequently, DOD lost opportunities to purchase the least cost, best service available. The problems resulted because routing technicians did not have the data they needed, did not use all the data available, or ignored certain criteria established for selecting the mode and carrier to be used.

2535 **(GAO/RCED—83-41) Analysis of DOE's Sunset review.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 22 Jul 1983. 22p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Title X, the Sunset Provisions of the Department of Energy (DOE) Organization Act, required that the President prepare and submit to the Congress a comprehensive review of DOE's programs. The review was completed by DOE and the report was provided to the Congress in February 1982. GAO analyzed the integrity of the sunset review and found that DOE's evaluation was carried out in a conscientious manner. Nevertheless, GAO also noted instances where DOE could have provided more through information in responding to title X.

2536 **(GAO/RCED—83-51) Federal Energy Regulatory Commission has expedited case processing; additional improvements needed.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 10 Jun 1983. 81p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

The Federal Regulatory Commission has implemented most of the recommendations made in GAO's July 15, 1980, report on the need for the Commission to expedite its processing of various types of applications (such as rate increase and licensing requests) from the electric power, natural gas, and oil pipeline industries. The result is that the number of cases backlogged beyond what the Commission considers a reasonable processing time has decreased from about 3600 cases in fiscal year 1978 to about 2000 cases in fiscal year 1982. The Commission, however, could further reduce the number of backlog cases by acting on the remaining recommendations cited in the report.

## 2901 Energy Analysis And Modeling

*REFER ALSO TO CITATION(S) 2495, 4238*

2537 **(DOE/EI/08607—T1) Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities.** Guill, G.D.; Schink, G.R.; Sheinin, Y. (Wharton (E.F.A.), Inc., Philadelphia, PA (USA)). Apr 1979. Contract AC01-77EI08607. 126p. NTIS, PC A07/MF A01. Order Number DE84002235.

Work on objectives to: provide EIA with a long-term macroeconomic forecasting model containing an embedded price sensitive input-output matrix; develop a satisfactory theoretical framework which allows for variable elasticities of substitution within the input-output matrix; and estimate and implement this theoretical framework subject to the constraints of data availability is described. The resulting variable substitution elasticity equations have

been incorporated into the Wharton Annual and Industry Forecasting Model (WAIFM) and are currently available via timesharing access. (PSB)

**2538 (DOE/NBB—0046) Overview of the Wharton School assessments of the short-term integrated forecasting system (STIFS).** (TERA, Inc., Arlington, VA (USA); Oak Ridge National Lab., TN (USA)). Jul 1983. Contract W-7405-ENG-26. 127p. NTIS, PC A07/MF A01. Order Number DE84001602.

Contents of 17 reports assessing the ARC79 version STIFS for adequacy of data sources, model formulations and documentation are reviewed. Most data problems dealt with timeliness of the frequent revisions to the historical data series used by the models. Model assessments focussed on individual models as tools of the STIFS analysts. Because estensive model-analyst interaction is a planned mode of operation for STIFS no attempt to evaluate the system as such was made. Many models, especially those employing trigonometric variables to represent seasonal trends, were found to have substantial lack-of-fit to historical data. Model forecast accuracy varied widely across models. Model documentation was felt to be inadequate especially with respect to explanations of model formulations and descriptions and sources of key model parameters, particularly those related to seasonal adjustments or user-given limits on allowable solution values. Despite this, most time series data used in the model could be identified and verified and most model parameter estimates could be duplicated, with more than a few exceptions. STIFS has undergone substantial revision since the ARC79 version.

**2539 (GAO/RCED—83-106) Analysis of the comprehensive energy emergency response procedures report.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 17 Feb 1983. 39p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

The Energy Emergency Preparedness Act of 1982 required the President to submit a series of reports to the Congress, including one detailing comprehensive energy emergency response procedures. The comprehensive procedures report was to describe options the President would consider using in an emergency, specify how potential response actions would be selected and implemented, and recommend additional laws that the President may need to deal with an emergency. GAO's evaluation of the report was requested by the Chairman and several members of the Senate Committee on Energy and Natural Resources. This is the last of a series of GAO reports analyzing various report submissions made under tha act GAO notes that the report lacks the desired specificity in describing options to be considered and the procedures to implement them and that key parts of the administration's energy emergency preparedness programs are still not ready.

**2540 (IKE—8-1) Analysis of the energy-political paths of the Enquete Commission.** Hoecker, K.H.; Magold, M.; Majer, H.; Scheirle, N.; Thoene, E.; Unger, H.; Wartmann, R. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). May 1982. 133p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE84750244.

The Enquete Commission "Future Energy Policy" presents analyses and recommendations to the public as an answer to basic energy-political problems. In its first working period the commission has developed four so-called energy paths which give information about "thinkable" developments in the energy economy of the F.R. of Germany. In order to assess these four extremely different paths the question must be asked whether these paths are consistent and realizable in their published form. The present report wants, on one hand, to analyze the model on which the study is based and, on the other, to examine the assumptions made and the results gained with regard to their economic and social relevance beyond the purely technical statements of the commission made so far. The main criteria of examination are the plausibility, the consistency and completeness of the study which is divided into model, assumption, and result analysis. Apart from the already known paths an additional path was calculated using changed assumptions which are presented in detail. It is to determine the effects of a combination of assumptions which have neither been considered in the four paths nor in the six variants belonging to the paths. This path is not at all to be considered more correct or true than the four others but chiefly to present the strong and weak points of path calculations in general - both in comparison and analyses.

## 2902 Economics And Sociology

*REFER ALSO TO CITATION(S) 1850, 2106, 2107, 2537, 2556*

**2541 (DOE/NV/00410—80) Affirmative Action Plan, October 1983 through September 1984.** (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)). Oct 1983. Contract AC08-76NV00410. 194p. D. Order Number DE84002803.

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This report documents Reynolds Electrical and Engineering Co., Inc., analysis of all major job groups with explanations if minorities and females are underutilized in any one or more job group. Goals and timetables have been developed and good faith efforts are directed to correct any deficiencies. In addition, Affirmative Action Plans for the Handicapped, Vietnam Era Veterans, and Disabled Veterans are included which set forth policies, practices, and procedures in accordance with Department of Labor regulations.

**2542 Energy conservation policies.** Chiogioji, M.H. (U.S. Dept. of Energy). pp 3-7 of Aluminum industry energy conservation workshop V papers. Washington, DC; The Aluminum Association (1980). (CONF-8009309—).

From 5. aluminum industry energy conservation workshop; Washington, DC, USA (16 Sep 1980).

The major thrust of the U.S. energy conservation strategy has been the deployment of various measures to overcome the various barriers to energy conservation. These measures include energy pricing and rate reform policies, information, education and training programs; government sponsored research development and demonstrations. Typically these have been done on a cost shared basis and the aluminum industry has been a major contributor to joint research in this particular area. Financial incentives are another area we have dealth with and when necessary, and only when necessary, regulations such as mandatory standards. Federal conservation policies seek to encourage energy saving technology and practices to try to minimize the need for cutback and abrupt changes in life style. We are embarking on this drastic program because of the growing scarcities and the rising cost of energy together with an increasing dependence upon imported petroleum mainly because this threatens both our economic stability and our national security.

## 2903 Environment, Health, And Safety

*REFER ALSO TO CITATION(S) 1855, 3275*

**2543 (PB—83-237214) Economic impact of acid rain legislation on Illinois.** (Illinois Environmental Protection Agency, Springfield (USA). Air Quality Planning Section). May 1983. 25p. NTIS, PC A02/MF A01.

This report estimates the cost to Illinois economy of complying with acid rain control legislation that would require an eight million ton reduction in sulfur dioxide within the 31 most eastern states. It is a strictly provential cost analysis; no benefits were included. Comprehensive impacts on Illinois economy were calculated using the Illinois Forecasting and Simulation Model, an econometric model of the state economy developed by Regional Economic Models, Inc. of Amherst, Massachusetts.

**2544 (PNL—4581-App.A-B) Assessment of cold-climate environmental research priorities. Appendixes A, B.** States, J.B. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1983. Contract AC06-76RL01830. 186p. NTIS, PC A09/MF A01. Order Number DE84002627.

These appendices present research plans in the areas of air pollution, water contamination/consumption, habitat modification and waste management that are relevant to the EPA's cold regions program. (ACR)

## 2904 Natural Resources

2545 **(TVA/OACD—83/15) New developments in fertilizer technology.** (National Fertilizer Development Center, Muscle Shoals, AL (USA)). 1983. 112p. (CONF-8310210—). NTIS, PC A06/MF A01. Order Number DE84900074.

From 14. TVA fertilizer conference on new developments in fertilizer technology; Muscle Shoals, AL, USA (5 Oct 1983).

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Exhibits and descriptions are presented for granular fertilizers, fluid fertilizers, slow-release fertilizers, agronomic research, and some pilot-plant and plant demonstrations are described.

2546 **(TVA/PUB—84/3) Tennessee Valley water resources: a strategy for the 1980s and beyond.** (Tennessee Valley Authority, Knoxville (USA)). Sep 1983. 61p. NTIS, PC A04/MF A01. Order Number DE84900076.

The water resource is the life blood of the Tennessee Valley. With the system of dams and reservoirs complete, TVA has begun to turn its attention away from building and developing and toward improved management - to maximize the contribution of the Valley's water resources toward economic growth while ensuring a quality environment. This proposal presents recommendations intended to: improve understanding, communication, and cooperative involvement in management of the Valley's water resources; restore and protect Valley water quality from significant sources of contamination; ensure an adequate supply of water for regional development; produce optimum multipurpose benefits through selective system enhancements and improved operation; reduce local flood damage and protect important Valley wetlands; and enhance Valley navigation capabiilty commensurate with transportation needs.

## 2905 Research, Development, Demonstration, And Commercialization

*REFER ALSO TO CITATION(S) 2083, 2177, 2572, 4199*

2547 **(CONF-8210211—1) Changing energy research priorities.** Shelton, R.B. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE84001948.

From Conference of the Association for University Business and Economic Research; Knoxville, TN, USA (25 Oct 1982).

The federal government's research and development budget, particularly the energy R & D budget, under the Carter and Regan administrations is discussed. There is a shift in priorities from civilian R & D to military R & D. In the case of energy, there is a shift from conservation and environmental research and from technological demonstrations to a relative emphasis on nuclear and defense-related research.

2548 (KFTI—81-52, pp 67-70) **State and problems of scientific research automation in radiation damage physics in KFTI.** Gann, V.V.; Zelenskij, V.F.; Kuz'michev, M.A.; Neklyudov, I.M. 1981. (In Russian). NTIS (US Sales Only), PC A05/MF A01. (CONF-8106218—No.3(9)).

From 7. all-union seminar on linear accelerators; Kharkov, Ukrainian SSR (2 Jun 1981).

Problems of automatization of theoretical and experimental investigations into physics of radiation damages at KhFTI of UkSSR Academy of Sciences have been considered. Main peculiarity is a complex approach to the automatization of experiment on materials technology envisaging the modelling of radiation effects, monitoring and control of materials irradiation at accelerators, centralized experimental data processing and interpretation of the results using mathematical models.

2549 **(LUTMDN/TMVK—3118/1-32/(1983)) Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks.** Olsson, B. (Tekniska Hoegskolan, Lund (Sweden). Institutionen foer Vaermeoch Kraftteknik). May 1983. 32p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751422.

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Statistical data concerning the transportation sector are discussed. Various investigations which handle the local and regional problems are referred to. The importance of the transport sector from the point of energy is dealt with. The planning of research and development is discussed and new projects are proposed.

## 2906 Nuclear Energy

*REFER ALSO TO CITATION(S) 1938, 1944, 2037, 2051, 2304, 2467, 2474, 2475, 2476, 2477, 2478, 2479, 4153*

2550 **(AD-P—001601/4) You have no right to make me think about this--the de-legitimation of current nuclear policies among key American elites.** Davies, R.G. (Culver Military Academy, IN (USA)). 16 Nov 1982. 15p. NTIS, PC A02/MF A01.

Until fairly recently, most segments of the American public, particularly our various elites, supported American nuclear policy, namely the maintenance of large and expanding nuclear stockpiles, the official foreswearing of the use of these weapons in a strategic first-strike, and the policy of threatening retaliation for Soviet nuclear attacks in war, by nuclear attacks on enemy cities and military centers. There is increasing evidence that this support is rapidly eroding; especially among key American elites. This is shown through increasingly vocal dissatisfaction with the continued growth and modernization of the nuclear stockpile; and second, in the dawning awareness of a discrepancy between our official policy of no first-strike and contingency plans to employ first-strike tactical nuclear weapons in the event of a Warsaw Pact attack upon Western Europe. Concerns have surfaced here due both to distaste at the growing size of our nuclear arsenal and the perception that we have not been altogether honest in our official stance of a no first-strike with nuclear weapons. Increasing numbers of Americans are coming to see our nuclear policy as inconsistent, senseless, and, most significantly, immoral, and therefore support a nuclear freeze.

2551 **(INIS-mf—8190) Nuclear industry review. Problems and prospects 1981-2000.** (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)). 1982. 73p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703329.

This review examines the consequences of projected excess electrical generating capacity for the maintenance of an independent nuclear power capability in Canada. Although consumption of electricity will continue to grow at rages well below historical averages, significant additions to capacity will be required in all parts of Canada in the 1990s. CANDU reactors are an attractive option for meeting load growth, particularly east of Manitoba. However, the absence of domestic orders in the 1980s may threaten the maintenance of this option. Even the most optimistic projections indicate that only one supplier of each component will remain in the nuclear business in the 1990s.

2552 **(INIS-mf—8627) Agreement on scientific and technical co-operation in the peaceful uses of nuclear energy between the National Laboratory of Industrial Engineering and Technology (LNETI) and the Commissariat a l'Energie Atomique (CEA).** (Portugal). 27 Nov 1980. 25p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704406.

Also in French.

This Agreement on scientific and technical co-operation in the nuclear field was signed between the French Atomic Energy Commission (CEA) and the Portuguese National Laboratory of Industrial Engineering and Technology (LNETI). The Agreement covers, inter alia, research in the safety of nuclear installations and radiation protection; radioisotope applications; radioecology; envi-

ronmental studies and the impact of nuclear energy on the environment. The Agreement, which became operational on the date of its signature by both Parties will remain in force for ten years. A Protocol, also signed on 27th November 1980 under the Agreement, defines the general conditions for scientific and technical co-operation between the CEA and the LNETI. (NEA).

2553 **Materials. The Argentine nuclear policy.** Strasser, H. Ebenhausen, Germany, F.R.; Stiftung Wissenschaft und Politik (1982). 168p. (In German). Stiftung Wissenschaft und Politik, Ebenhausen (Germany, F.R.).

Part A of the volume contains a literature search on proliferation and the Third World and on the nuclear technology of Argentina. The materials in part B are divided in: 1. Nonproliferation discussion and the Third World. 2. Development and state of nuclear technology in Argentina. 3. Argentina's international contacts in the field of nuclear energy 1. Federal Republic of Germany, 2. Soviet Union, 3. Brazil. (orig./HP).

## 2908 Waste Heat Utilization

*REFER ALSO TO CITATION(S) 2556, 2584*

2554 **Department of Energy programs on cogeneration and their economics.** Streb, A.J. (U.S. Department of Energy). pp 39-45 of Aluminum industry energy conservation workshop V papers. Washington, DC; The Aluminum Association (1980). (CONF-8009309—).

From 5. aluminum industry energy conservation workshop; Washington, DC, USA (16 Sep 1980).

Cogeneration is discussed. By using the thermal output of gas turbines and diesels, about 40,000 MW of additional capacity can be obtained. Developing cogeneration around a somewhat higher power mix, 120,000 MW can be obtained. DOE is involved in systems analysis for industrial cogeneration, and the development of waste heat engines: Rankine systems and Brayton systems, and fuel flexible topping cycle systems. Other DOE supported demonstration projects are discussed. The relation between the indentical cogeneration and the small power producers is discussed. Re-evaluation of industrial processes and the use of alternative fuels is suggested.

## 2910 Conservation

*REFER ALSO TO CITATION(S) 2536, 2557, 2588, 2590, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2618, 2619, 2624, 2626, 2668, 4271*

## 2920 Supply, Demand, And Forecasting

*REFER ALSO TO CITATION(S) 1892, 2531, 2570, 2571, 2590*

2555 **(EUR—8542-EN) Econometric estimates of the EDM model (Italian version of Frankfurt and Cambridge model).** (Applicazioni e Ricerche Scientifiche, Milan (Italy)). 1983. 94p. Europen Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037.

The work done to update and improve the existing version of EDM/Italy is described. The debugging, checking and final delivery of the system was done. Then a new base case for forecasts was developed. EDM/Italy data base was updated to 1979 and many data were corrected after a careful checking, particularly for 1976-1978. Following some ENEA requirements, gas series were split into natural and other gases and all non private land transportation consumption were concentrated in LT sector. Single price indexes for energy products were substituted by a matrix of different prices for different sector uses of fuels. The remaking of estimations has been extensive and the outcome has been a set of more reliable and price sensitive equations, both for total and single product demands, although the main basic features of original EDM/Italy did not change dramatically. Finally a test was performed of the so called Cambridge system specification of EDM, against the Frankfurt single equation version, which is used at present for Italy. The main conclusion was that the effort to substitute the Cambridge version for the existing one would not be worthwhile, but there's some evidence that the latter may make use of the former, as a helpful tool for testing its properties.

2556 **(NP—3770414) Sri Lanka - energy situation 1981/82.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Dec 1982. 12p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83770414.

The energy situation of Sri Lanka is reviewed on the basis of some relevant data. Its energy policy is commented on, and developments in electric power generation are described as well as the trends observed for the various energy sources. Figures are given on external trade.

2557 **(NP—3770415) Greece - energy situation 1981/82.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Jun 1983. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83770415.

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The energy situation of Greece is reviewed on the basis of some relevant data. Its energy policy is commented on, and developments in electric power generation are described as well as the trends observed for the various energy sources. Figures are given on external trade.

2558 **(NP—3770416) Switzerland - energy situation 1981.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Dec 1982. 27p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83770416.

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The energy situation of Switzerland is reviewed on the basis of some relevant data. Its energy policy is commented on, and developments in electric power generation are described as well as the trends observed for the various energy sources. Figures are given on external trade.

## 2930 Policy, Legislation, And Regulation

*REFER ALSO TO CITATION(S) 1809, 1850, 2566, 2567*

2559 **(GAO/RCED—83-142) State and local responses to natural gas price increases.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 25 Apr 1983. 46p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Increasing natural gas prices affect gas customers, the distribution companies that supply them, and the state or local commissions that regulate such sales. This report provides information on state and local responses to higher gas costs in the areas of: rates charged by pipelines to distribution companies; recovery of purchased gas costs by distributors; rates charged by distributors to customers; and efforts by distributors to maintain or expand their markets. The report is based on a survey of 15 states and 37 gas distribution companies.

2560 **(N—8326755) Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984.** (Committee on Appropriations (U.S. House), Washington, DC). 1983. 43p. Committee on Appropriations (U.S. Senate), Washington, DC.

Bill referred to the Comm. on Appropriations, 98th Cong. 1st Sess., 24 May 1983.

The budget appropriations for FY 1983 for the National Science Foundation, the National Aeronautics and Space Administration, the Department of Housing and Urban Development-Independent Agencies are presented.

## 2940 Fossil Fuels

*REFER ALSO TO CITATION(S) 1809, 1813, 1813, 1850, 1863, 1876, 1892*

**2561 (GAO/ID—83-44) Information on the operation of the International Energy Agency's Coal Industry Advisory Board.** (General Accounting Office, Washington, DC (USA). International Div.). 21 Apr 1983. 9p. General Accounting Office, Gaithersburg, MD 20760.

This report was prepared at the request of Senator Howard Metzenbaum and is addressed to him. Information is provided on the composition and role of the Coal Industry Advisory Board (CIAB) of the International Energy Agency. The following points are addressed: (1) why the CIAB was established; (2) its structure and organization; (3) how it operates; and (4) its reports. It also presents an overview of the decision to extend the term of the CIAB. A list of CIAB members is included. (DMC)

**2562 (KTM/E-B—24) Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 58p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751449.

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The report deals with the competitiveness of peat in condensing power plants. Additionally the cost of producing auxiliary condensing power with peat in combined district heating and condensing power plants has also been studied. The study includes the following plant sizes: condensing power plants 50 MW, 115 MW, 200 MW, 2 x 200 MW and 2 x 500 MW, combined power plants 55-70 MWh/MWt, 105-170 MWe/MWt. The cost calculations for the condensing power plants of 50 MW and 115 MW concern only peat while those for the largest plant 2 x 500 MW consern only coal. All costs are from the end of 1982. The cost of producing condensing power by peat has been estimated to around 21,6-25,4 p/MWh with a fuel price of 44 mk/MWh and a utilization time of 6000 h/a. Comparing calculations for coal give a energy production cost ranging between 21,5-25,3 p/kWh when using a coal price of 53 mk/MWh. With a price of 48 mk/MWh for peat at the plant, the cost of auxiliary condensing power is 21,5-22,1 p/kWh as the utilization degree of condensing power capacity in the combined plant is 80%. The study has been carried out on a general level and it has not been able to consider special features in individual plants. The results should therefore not be used directly when deciding upon a fuel or an investement.

**2563 (N—8327922) After energy price decontrol: The role of government conservation programs.** Besen, S.M.; Johnson, L.L. (RAND Corp., Santa Monica, CA (USA)). Oct 1982. 61p. (RAND/N—1903-DOE). NTIS, PC A04/MF A01.

Energy conservation and price distortions, government intervention in response to price distortions, and the government role in a regime of correct prices are discussed.

**2564 (NP—3770417) DEMINEX activities 1980.** (Deminex-Deutsche Erdoelversorgungsgesellschaft m.b.H., Essen (Germany, F.R.)). Jan 1981. 23p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83770417.

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Information on the activities of the mineral-oil and natural gas extracting company: production, field development, exploration all over the world. Further reports on financing, staff, external branches, societies, management.

**2565 (NP—3770419) Switzerland and mineral oil 1981-1982.** (Shell Switzerland, Zurich). Jun 1982. 29p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83770419.

Various relevant factors of the development of the mineral oil business are compiled. The focus is on the Swiss market. This compilation is meant to promote understanding of the interrelationships on the market. The figures published are based on the annual report of the Swiss Mineral-oil Association and on information obtained from the Shell company.

## 2960 Electric Power

*REFER ALSO TO CITATION(S) 2527*

**2566 (DOE/EI/02295—1) Stochastic stability research for complex power systems.** (Massachusetts Inst. of Tech., Cambridge (USA)). Feb 1983. Contract AM01-76EI02295. 114p. NTIS MF A01. Order Number DE84001620.

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Covered are: Asymptotic Analysis and Approximation of Hybrid Systems; Stochastic Bifurcation and Singular Perturbation; Stability and Control of Hybrid Systems; The Thermodynamic Properties of Markov Processes; Conservative and Dissipative Systems; and Deterministic Analysis of Stability.

**2567 (DOE/ET/29033—1) Large-scale-system effectiveness analysis.** (Systems Control, Inc., Burlington, MA (USA); Massachusetts Inst. of Tech., Cambridge (USA). Lab. for Information and Decision Systems). Feb 1982. Contract AC01-77ET29033. 157p. NTIS, PC A08/MF A01. Order Number DE84001492.

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A methodology for large-scale-system effectiveness analysis with application to electric power systems is presented. Three component attributes of effectiveness are introduced: sufficiency, efficiency, and equitability. The power system is divided into the supply part and the demand part. The feasibility set is introduced to characterize the supply system: it is the set of all substation loads that the system can serve. The feasibility set and its properties are analyzed on the basis of the DC model. The transportation flow model is also used and the relationship between the two feasibility sets is established. Procedures are developed for reducing the number of linear constraints that describe the set as a convex polyhedron. The problem of dimensionality motivates the introduction of an aggregation procedure based on a continuum viewpoint; a partial differential equation analog to the DC model is derived. It is then shown that the resulting aggregate feasibility set is a good approximation to the discrete one when the system is large. Characterization of demand in a way that is commensurate with the feasibility set is achieved through the introduction of the minimum requirement curve (MRC) defined at the end-user nodes. To effect the comparison, the end-user MRC's are reflected backwards to the substation through probabilistic distribution systems. Interaction of the feasibility set with the MRCs at the substations constitutes the basis for the determination of sufficiency. Procedures are outlined for computing the set. Primitives and attributes that can be used to carry out comparisons are discussed.

**2568 (DOE/ET/29034—1) Multivariable control for electric-generating plants, September 1978-February 1982.** Harvey, C.A.; Barrett, M.F.; Doyle, J.C.; Wall, J.E. (Honeywell, Inc., Minneapolis, MN (USA). Systems and Research Center). Apr 1982. Contract AC01-78ET29034. 102p. NTIS MF A01. Order Number DE84001621.

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Advancements of multivariable control technology were developed to make possible the design of improved controllers for electric generating plants. These improved controllers should provide stability and good performance in response to commands (demands) in the face of plant parameter variations, noisy measurements, and actuator outages. Experimental analysis of the design technology was carried out using a realistic analytical model of a generating plant. The technology advances and the experimental analyses are described in this report. The technology developments provide characterizations of: (1) limits on achievable performance of multivariable feedback systems; (2) conservatism of robustness tests; and (3) optimal linear regulators with respect to integrity. The experimental analyses demonstrate the practicality of basing designs on the frequency responses of singular values of (matrix) multivar-

iable input-output transfer functions. Tradeoffs associated with performance, robustness, bandwidth, and their relation to non-minimum phase zeros are illustrated.

2569 **(DOE/ET/29035—1) Large-scale-system effectiveness analysis.** (Texas A and M Univ., College Station (USA). Research Foundation). Nov 1979. Contract AS01-77ET29035. 81p. NTIS, PC A05/MF A01. Order Number DE84001637.

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Objective was the development of methods for calculating absolute system reliability indices. Such indices are a necessary prerequisite to any scheme for system optimization which includes the economic consequences of consumer service interruptions. Emphasis has been the investigation of operating considerations having an impact on reliability performance and the development of models capable of including the effects of these operating considerations. In particular, attention has been focused on modeling operating considerations in generation reliability studies and on modeling protection and control systems in transmission and distribution system studies. A further area of investigation has been joint consideration of generation and transmission in reliability studies. More accurate and detailed modeling of systems by analytical methods usually leads to an increase in model dimensions. Therefore, methods for coping with reliability investigations in high-dimension models and systems have also been studied. Methods for finding or estimating the probability distributions of some measures of reliability performance have been developed. The research project has sought to examine the applicability of both analytical and Monte Carlo simulation approaches to system reliability modeling.

2570 **(DOE/RG/09154—T2) Consumer-related energy activities in Illinois. Final report, October 1, 1977-December 31, 1981.** (Illinois Office of Consumer Services, Springfield (USA)). 26 Mar 1982. Contract FG01-77RG09154. 90p. NTIS MF A01. Order Number DE83017330.

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In 1977 the Office established a timetable for meeting DOE program requirements of Section 460.12(b). This entailed establishing a Citizen's Advisory Council, regional hearings and developing detailed rules and regulations for the Office. As envisioned, the rulemaking process sought the direct involvement and input of business and consumer representatives. With their involvement, the Office proceeded to refine the key program elements into workable program activities which insured greater, more responsible public participation and representation in state public utility regulation decisionmaking.

2571 **(DOE/RG/10174—T1) Applicability of ratemaking and lifeline-rate standards of PURPA.** (Kennedy/Jenks Engineers, Sacramento, CA (USA)). Apr 1981. Contract FG01-79RG10174. 66p. NTIS, PC A04/MF A01. Order Number DE84002691.

The information reviewed pertaining to the ratemaking and lifeline rate standards suggests that the City should adopt (1) the cost of service standard, (2) the declining block rate standard, and (3) the interruptable rate standard on a voluntary basis, and should not adopt, at the present time, (1) the time-of-day standard, (2) the seasonal rate standard, (3) the load management standard, and (4) the lifeline rate standard. The findings and conlcusions which provide support for our opinions are presented in this report.

2572 **(GAO/RCED—83-147) Lengthy case processing causes overlapping of electric rate increases.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 1 Aug 1983. 16p. US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760.

Report to the Chairman, Subcommittee on Energy, Nuclear Proliferation and Government Processes Committee on Governmental Affairs, United States Senate.

Overlapping of electric rate increases occurs because under law and regulation, utilities can take advantage of the Federal Energy Regulatory Commission's lengthy rate case processing time by filing successive applications for rate increases and putting them into effect while awaiting approval on previously filed applications. This report discusses the extent of overlapping rate increase cases and associated problems, effect of such cases on investor-owned utilities and wholesale and retail customers, and efforts the Commission has taken to lessen or eliminate the impacts of overlapping rate increases.

2573 **(LBL—11531) Regulation and system interdependence: effects on the siting of California electrical energy facilities.** Kooser, J.C. (Lawrence Berkeley Lab., CA (USA)). Nov 1980. Contract AC03-76SF00098. 184p. NTIS, PC A09/MF A01. Order Number DE84002888.

Portions are illegible in microfiche products; Thesis.

This study focuses on two aspects of the siting process for California electrical energy facilities: regulation of the siting process by the California State Energy Commission and the role of increasing system interdependence on the siting process. This study includes a review of public facility location theory and an evaluation of its contribution to the study of the electrical facility location problem. System interdependence, which refers to the physical and institutional arrangements of the utilities that demonstrate their interconnectedness, is specifically studied by examining the development and use of power pooling within the state to manage the supply of electricity. The examination of power pooling allows conclusions to be drawn about the effects of system interdependence on the siting process for new electrical energy facilities. 139 references.

2574 **(NP—3770418) Badenwerk - annual report 1982.** (Badenwerk A.G., Karlsruhe (Germany, F.R.)). 1983. 56p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83770418.

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Description of structure and activities of this electricity supply company. This was used as the basis of information on the shareholder's meeting on July 1st. 1983. Explanations on the annual balance sheet are given further the report of the supervisory board is provided. Annex: annual balance sheet, profit and loss account.

2575 **Using simulation for policy evaluation in the electric utility industry.** Ford, A. (Los Alamos National Lab., NM). *Simulation;* **40**: No. 3, 85-92(Mar 1983).

A system dynamics model has been used in policy evaluation for the U.S. investor-owned electric utility industry. We provide a brief description of the model assumptions and major applications. Illustrative results include (1) an analysis of the advantages of constructing power plants with short lead times and (2) the effects on electricity rates of an overbuilding program designed to reduce dependence on oil or natural gas. We conclude with a discussion of model validation and current research.

## 2990 Unconventional Sources And Power Generation

*REFER ALSO TO CITATION(S) 2083, 2092, 2106, 2107, 2130, 2135, 2161, 2177, 2641*

2576 **(EFI-TR—2772) New, renewable energy sources in the Norwegian energy production system. Summary report.** Johannesen, A. (Elektrisitetsforsyningens Forskningsinstitutt, Trondheim-NTH (Norway)). Sep 1981. 37p. (In Norwegian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751461.

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The renewable energy sources considered include solar energy for water and space heating; wind power and ocean wave power for electricity production. Technical and economic consequenses from bringing these new energy sources into the Norwegian energy supply system have been investigated from a systems analysis point of view. The reported calculations refer all to the year 2020, and a base load demand of ca 128 TWh/y has been assumed. The electric power production in Norway has up to now been entirely hydroelectric. Concerning the extent of the future development of hydroelectric power, three figures for the production

in the reference year have been used: 107, 115 and 123.5 TWh/y. A summary of the results of an extensive analysis of the interplay between the hydroelectric power production system and possible contributions from solar-, wind- and ocean wave power is presented. 5 drawings, 6 tables.

2577 **(KTM/E-D—23) Potential production and consumption figures of indigenous fuels in Finland.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 59p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751446.

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The aim of this study has been to determine the potential production and consumption figures of indigenous fuels from a technical point of view up to the year 1995. Indigenous fuels that have been considered in the study are: peat, fuel wood, wood waste and spent liquors from the wood industry, refuse, waste water and sludge and straw. The consumption is divided into different sectors: industry, district heating production and households. The 1981 production and consumption figures have been used as a basis for the study. The estimate of the potential production and consumption is based on a 3% annual growth in the industry and that no essential changes in the fuel price relations are to take place. Additionally it has been assumed that the present consumption of coal and natural gas will not be replaced by indigenous fuels. The consumption of indigenous fuels in 1981 was about 4,3 million tons of oil equivalents (Mtoe). The figure is estimated to be about6,1 Mtoe in 1995. The potential production of indigenous fuels for 1995 is 10,6 Mtoe, which is significantly higher than the corresponding consumption at the same time. This is the case for all indigenous fuel except for wood waste and liquors in the wood industry, for which the estimated production and consumption figures are equal.

2578 **(NE—1983-14) Energy supplies. Proposals for research and development after 1984.** Brandels, L. (ed.). (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). 1983. 126p. (In Swedish). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751423.

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The aim of the program is to develop techniques and to clarify the conditions of permanent and renewable energy sources in a short and in a medium space of time. The object is to decrease the dependence on oil. Four different levels of expenditures (public grants) are presented, from 188 M SEK to 960 M SEK for the period 1984 to 1987.

# 30 DIRECT ENERGY CONVERSION

## 3001 Mhd Generators

2579 **(DOE/ET/15602—T6) MHD air heater technology development. Technical progress report, October 1, 1982-September 30, 1983.** (FluiDyne Engineering Corp., Minneapolis, MN (USA)). Oct 1983. Contract AC22-80ET15602. 5p. NTIS, PC A02/MF A01. Order Number DE84001098.

Immediately prior to the reporting period, on September 24, 1983, a Stop Work Order was issued by DOE for all work under this contract. (Work had already been essentially stopped by FluiDyne in June, 1982, due to the lack of sufficient funds allocated to the contract.) The Stop Work Order remained in effect until December 22, 1982, at which time it expired. Agreement was reached with the DOE Project Manager that certain specific items of work should be completed, as follows: (A) compilation and evaluation of the small scale test results concerning corrosion resistance and thermal shock resistance of candidate HTAH ceramic materials; (B) analysis of data on valve leakage and performance of ceramic materials under pressure cycling in the HTAH environment obtained in previously completed tests; (C) analysis of HTAH system performance data obtained from previously completed computer runs; (D) preparation of a report to document the work accomplished under the contract since November 1979. Work accomplished is briefly described. (WHK)

2580 **(DOE/ET/15614—8) MHD-generator component development. Quarterly report, July 1981-September 1981.** (Avco-Everett Research Lab., Everett, MA (USA)). Nov 1981. Contract AC22-80ET15614. 56p. NTIS, PC A04/MF A01. Order Number DE84002026.

The overall objectives of this program are to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/) and to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. Progress on the following tasks is described: Task 1) MHD channel design and performance; Task 2) MHD channel construction and lifetime; Task 3) MHD channel loading and control; Task 4) facility operation; Task 5) CDIF Hardware; and Task 6) integrated coal-fired flow train testing. (WHK)

2581 **(DOE/ET/15614—9) MHD-generator component development. Quarterly report, October 1981-December 1981.** (Avco-Everett Research Lab., Everett, MA (USA)). Feb 1982. Contract AC22-80ET15614. 79p. NTIS, PC A05/MF A01. Order Number DE84002028.

The overall objectives of this program are twofold: (1) to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/), and (2) to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. Progress on the following tasks is summarized: (1) MHD channel design and performance; (2) MHD channel construction and lifetime; (3) MHD channel loading and control; (4) facility operation; (5) CDIF hardware; and (6) integrated coal-fired flow train testing. (WHK)

2582 **(DOE/ET/15614—10) MHD-generator component development. Quarterly report, January 1982-March 1982.** (Avco-Everett Research Lab., Everett, MA (USA)). May 1982. Contract AC22-80ET15614. 51p. NTIS, PC A04/MF A01. Order Number DE84002029.

The overall objectives of this program are: to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/) and to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. MO24, effective February 24, 1982, has been executed. The revised contract work statement provides for the testing of a coal-fired MHD flow train, in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. Progress is summarized on the following tasks: Task 1) MHD channel design and performance, Task 2) MHD channel construction and lifetime, Task 3) MHD channel loading and control, Task 4) facility operation, Task 5) CDIF related hardware, and Task 6) integrated coal-fired flow train testing. (WHK)

2583 **(DOE/ET/15614—11) MHD-generator component development. Quarterly report, April 1982-June 1982.** (Avco-Everett Research Lab., Inc., Everett, MA (USA)). Aug 1982. Contract AC22-80ET15614. 69p. NTIS, PC A04/MF A01. Order Number DE84002037.

The overall objectives of this program are two-fold: (1) to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/); and (2) to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. MO24, effective February 24, 1982, has been executed. The revised contract work statement provides for the testing of a coal-fired MHD flow train in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. The revised program consists of a series of related tasks: (1) MHD channel design and performance; (2) MHD channel construction and lifetime; (3) MHD channel

loading and control; (4) facility operation; (5) CDIF related hardware; and (6) integrated coal-fired flow train testing. Progress is reported. (WHK)

2584 **(DOE/ET/15614—13) MHD-generator component development. Quarterly report, July 1982-September 1982.** (Avco-Everett Research Lab., Everett, MA (USA)). Nov 1982. Contract AC22-80ET15614. 105p. NTIS, PC A06/MF A01. Order Number DE84002025.

The overall objectives of this program are to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD Generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/) and to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. MO24, effective February 24, 1982, has been executed. The revised contact work statement provides for the testing of a coal-fired MHD flow train in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. Progress is reported. (WHK)

2585 **(DOE/ET/15614—14) MHD-generator component development. Quarterly report, October 1982-December 1982.** (Avco-Everett Research Lab., Everett, MA (USA)). Feb 1983. Contract AC22-80ET15614. 78p. NTIS, PC A05/MF A01. Order Number DE84002027.

The overall objectives of this program are two-fold: (1) to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/), and (2) to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. MO24, effective February 24, 1982, has been executed. The revised contact work statement provides for the testing of a coal-fired MHD flow train in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. Progress is reported on the following tasks: (1) MHD channel design and performance; (2) MHD channel construction and lifetime; (3) MHD channel loading and control; (4) facility operation; and (5) CDIF related hardware. (WHK)

2586 **(DOE/ET/15614—15) MHD-generator component development. Quarterly report, January 1983-March 1983.** (Avco-Everett Research Lab., Inc., Everett, MA (USA)). May 1983. Contract AC22-80ET15614. 80p. NTIS, PC A05/MF A01. Order Number DE84002030.

The overall objectives of this program are two-fold: (1) to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/); and (2) to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. M024, effective February 24, 1982, has been executed. The revised contract work statement provides for the testing of a coal-fired MHD flow train in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. Progress is detailed on the following tasks: (1) MHD channel design and performance; (2) MHD channel construction and lifetime; (3) MHD channel loading and control; and (4) facility operation. (WHK)

2587 **(DOE/ET/15614—16) MHD-generator component development. Quarterly report, April 1983-June 1983.** (Avco-Everett Research Lab., Everett, MA (USA)). Aug 1983. Contract AC22-80ET15614. 74p. NTIS, PC A04/MF A01. Order Number DE84002031.

The overall objectives of this program are to contribute, by appropriate systematic experimental and analytical investigations, to the engineering data base necessary for the design and construction of MHD generators at CDIF-scale (50 MW/sub th/) and baseload scale (2000 MW/sub th/) and to design and fabricate specific hardware items to be tested at the CDIF site in Butte, Montana. A contract change order incorporated in Modification Mod. MO24, effective February 24, 1982, has been executed. The revised contract work statement provides for the testing of a coal-fired MHD flow train in the Mk VI facility, additional hours of long duration testing, and the deletion of some items of deliverable hardware to the CDIF. Progress is detailed on the following tasks: (1) MHD channel design and performance; (2) MHD channel construction and lifetime; (3) MHD channel loading and control; and (4) facility operation. (WHK)

2588 **(MHD-III—82-048) Coal-fired MHD combustor development project: Phase IIIA. Final technical report.** Iwata, H.; Braswell, R. (TRW Energy Development Group, Redondo Beach, CA (USA)). Aug 1983. Contract AC22-81PC40502. 79p. NTIS, PC A05/MF A01. Order Number DE83018285.

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The primary objective of Phase IIIA of the Coal-Fired MHD Combustor Development Project was to assess the steady state performance and endurance capability of the 20 MW/sub t/ MHD slagging coal combustor and auxiliary equipment. The secondary objective was to demonstrate a continuous operational capability for supplying reactants (specifically coal) and removing slag from the pressurized combustor with no operational perturbations. This objective was to be accomplished by appropriately upgrading the existing test facility to provide a capability for continuously operating a 20 MW/sub t/ MHD slagging coal combustor. Progress is detailed. (WHK)

2589 **(MHD-III—83-070) Coal-fired MHD Combustor Development Project. Phase IIIC. First quarterly technical progress report, 1 July-30 September 1983.** (TRW Energy Development Group, Redondo Beach, CA (USA)). 20 Oct 1983. Contract AC22-83PC60577. 46p. NTIS, PC A03/MF A01. Order Number DE84001523.

The first quarterly technical progress report of the Coal-Fired MHD Combustor Development Project (Phase IIIC) presents the accomplishments during the period 1 July to 30 September, 1983. The scope of work covered by this quarterly report relates to those tasks associated with the fabrication of the slagging stage of the 50 MW/sub t/ coal-fired combustor (CFC) and the preparation of the TRW 50 MW/sub t/ test facility. Progress during this reporting period included the following: (1) detail design of the 50 MW/sub t/ test support hardware (i.e., second stage afterburner, stand, fluidizer, scrubber, etc.) was 95% completed and procurements were initiated; (2) the fabrication of all components which comprise the 50 MW/sub t/ slagging stage was initiated and approximately 75% of the hardware has been completed and delivered to TRW for integration; (3) preparation of the assembly and test area was initiated and is 75% completed; (4) the facility preparation plans for upgrading FETS Cell 2 for 50 MW/sub t/ operation were completed and the detail test plan was 75% completed; and (5) the overall program plan and schedule for accomplishing the two tasks of this contract is shown.

## 3005 Fuel Cells

*REFER ALSO TO CITATION(S) 2518*

2590 **(DOE/NASA/17088—4) Economic competitiveness of fuel cell onsite integrated energy systems.** Bollenbacher, G. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Aug 1983. Contract AI21-80ET17088. 68p. (NASA-TM—83403). NTIS, PC A04/MF A01. Order Number DE84002166.

This report examines the economic competitiveness of fuel cell onsite integrated energy systems (OS/IES) in residential and commercial buildings. The analysis is carried out for three different buildings with each building assumed to be at three geographic locations spanning a range of climatic conditions. Numerous design options and operating strategies are evaluated and two economic criteria are used to measure economic performance. In general the results show that fuel cell OS/IES's are competitive in most regions of the country if the OS/IES is properly designed. The preferred design is grid connected, makes effective use of the fuel

cell's thermal output, and has a fuel cell powerplant sized for the building's base electrical load.

2591 **(DOE/SF/01264—T1) On-site fuel-cell resource conservation in industrial-process applications. Final report.** (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). 19 Aug 1977. Contract AC03-76SF01264. 250p. NTIS, PC A11/MF A01. Order Number DE84002810.

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The fuel cell powerplant embodies many attractive features including high electrical efficiency, simple recovery of heat, size flexibility, and lack of disturbance to the environment. As a result, systems incorporating fuel cell powerplants can be located on-site, close to the point of energy demands, permitting effective utilization of recovered heat. In this way, over 80% of the energy value of the fuel can be utilized leading to significant energy resource savings. This investigation has addressed conservation potential with on-site fuel cell systems in industrial applications. This investigation was limited in two ways: First, the analysis only examined energy resource conservation potential with on-site fuel cell systems applied at the industrial process level; and second, the number of processes investigated was, of necessity, limited. Twelve specific industrial processes were selected for study by Gordian Associated, Incorporated, based upon screening of ten major industries, including petroleum refining, basic petrochemicals, fertilizer, food, aluminium, copper, steel, paper, rubber, and plastics. An on-site fuel cell system was defined and the energy resource consumption was for each of the selected industrial processes. When compared with conventional systems, energy resource savings of 190,000 barrels of oil equivalent per day are possible through extensive use of on-site fuel cell systems in the selected processes. The potential energy resource savings for the individual processes examined are indicated. With potential savings of 54,000 barrels of oil (equivalent) per day, the largest savings are found in petroleum refining. Of the twelve processes, newsprint production offers the greatest relative savings - 32%.

2592 **Porous electrolyte retainer for molten carbonate fuel cell.** Dusek, J.T.; Singh, R.N. (to Dept. of Energy). US Patent 4,389,467. 21 Jun 1983. Filed date 28 Nov 1980. vp. PAT-APPL-211001.

A porous tile for retaining molten electrolyte within a fuel cell is prepared by sintering particles of lithium aluminate into a stable structure. The tile is assembled between two porous metal plates which serve as electrodes with fuels gases such as $H_2$ and CO opposite to oxidant gases such as $O_2$ and $CO_2$. The tile is prepared with a porosity of 55-65% and a pore size distribution selected to permit release of sufficient molten electrolyte to wet but not to flood the adjacent electrodes.

### 3008 Miscellaneous Converters

2593 **Pyroelectric energy conversion: Hysteresis loss and temperature sensitivity of a ferroelectric material.** Olsen, R.B.; Evans, D. (Power Conversion Technology, Incorporated, San Diego, California 92121). *Journal of Applied Physics;* **54**: No. 10, 5941-5944(Oct 1983).

Measurements of polarization versus applied electric field have been made on specimens of lead zirconate modified with $Sn^{4+}$ and $Ti^{4+}$ as a function of temperature. These data were analyzed to estimate the amount of hysteretic loss which may be encountered in heat-to-electrical conversion using this ferroelectric. The hysteretic loss is determined to be small (8% to 16% of the total electrical energy). Also analyzed was the sensitivity of the electrical energy output to the operating temperature. Eighty percent of the maximum energy production is estimated to be available over a 16 °C range of conversion cycle mean temperatures (for cycles with 25 °C temperature excursions).

## 32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

*REFER ALSO TO CITATION(S) 2549*

2594 **(CONF-830982—1) Measuring effects of utility conservation programs: inputs to utility decision making.** Hirst, E. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE84001962.

From National conference on utility conservation programs: planning, analysis, implementation; New Orleans, LA, USA (13 Sep 1983).

Evaluation of utility conservation program performance is discussed. The emphasis is on measurement - use of actual program-generated data (e.g., utility bills), customer self-reports on conservation actions, program cost data) - rather than a priori planning analyses to assess the worth of utility programs.

2595 **(DOE/CS/20396—T1) Energy and economic development: a practical guide for the 1980's.** (Department of Commerce, Washington, DC (USA)). Aug 1983. Contract AI01-79CS20396. 17p. NTIS, PC A02/MF A01. Order Number DE84002135.

A program in 1979 provided seed funds for 16 economic development districts throughout nonmetropolitan America. A brief summary of the grant project and the National Educational Institute for Economic Development's findings on the program are reviewed. (MHR)

2596 **(EUR—8628-EN) Analysis of medium-term economic development and energy consumptions through the EURECA-EXPLOR-EDM model chain. Final report.** Merzagora, N. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Direzione Centrale Studi dell'Energia Nucleare e delle Energie Alternative (ENEA)). 1983. 133p. European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

The macroeconomic and sectorial results obtained through a series of Explor-EDM runs are described; their achievement also required the introduction of some innovations in the data banks. Throughout this work some exogenous variables in the Explor model data bank were focused, which now require up-dating and new calibration. The re-structuring work of the data bank as a whole started, and new simulation tests will be performed after its completion. The main innovations required are as follows: introduction of the new macroeconomic assumptions worked out by the EEC through the Eureca model; introduction of the new historic sequence of energy consumption. In particular: gases were subdivided into natural gas and other gases; the consumptions arising from industrial transport were separated from the industrial consumptions and classified under transport; the historic sequence of consumptions was prolonged till 1979; and introduction of the new econometric estimates.

### 3201 Buildings

*REFER ALSO TO CITATION(S) 2136, 2138, 2584, 2639, 2659, 4271*

2597 **(BBN—3606) Technical assistance for Project Conserve. Final report.** (Bolt, Beranek and Newman, Inc., Arlington, VA (USA)). 15 Jul 1977. 224p. NTIS, PC A10/MF A01. Order Number DE83018241.

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Project Conserve is a program whereby homeowners complete and mail questionnaires on the physical properties of their houses, and subsequently receive in response computer-generated advice on how they can reduce the fuel required to heat/cool their homes. The number of states that might use Project Conserve changed frequently during the first month of the contract: from six to eight; to 14; and finally to two states: Massachusetts and New Mexico. Twelve other states were subsequently selected by the FEA to operate a variety of other homeowner energy conservation programs. These latter were referred to as Home Energy Savers'

Programs (HESP). The following are included here: major milestones; accomplishments and problems; a chronological listing of the contract effort; descriptions of the State Co-ordinator's Manual, the State Training course, the Massachusetts and New Mexico Project Conserve Programs, and the Home Energy Savers Programs; summary of contract deliverables; and a chronology of events. (MHR)

2598 **(BFR-D—2-1983) Air infiltration control in housing. A guide to International Practice.** Elmroth, A.; Levin, P. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1983. 399p. NTIS (US Sales Only), PC A17/MF A01. Order Number DE83751425.

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This handbook, which forms part of the work of the AIC (Air Infiltration Centre), reviews the state of the art with respect to problems associated with a buildings airtightness in the countries which take part in the work within the AIC. General principles, motives, standards, assumptions, climate, energy balance in a house, and common recurring design solutions for both existing and new buildings are treated in the handbooks general section, Part A. Part B of the handbook contains detailed information about the climate in different countreis. It has a main section for each country and each section contains several design examples showing how building structures can be produced to achieve a resonable degree of airtightness. In general, these show examples of good design technology in the respective country. The air infiltration centre was inaugurated through the International Energy Agency and is funded by ten of the member countries: Canada, Denmark, Italy Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom and United Staes of America. The Air Infiltration Centre provides technical support to those engaged in the study and prediction of air leakage and the consequential losses of energy in buildings. The aim is to promote the understanding of the complex air infiltration processes and to advance the effective application of energy saving measures in both the design of new buildings and the improvement of existing building stock.

2599 **(CONF-811288—) Energy research in Berlin. Solar energy utilization by climate-adjusted planning and building.** (Senat fuer Wissenschaft und Forschung, Berlin (Germany, F.R.)). 1981. 127p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770420.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

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This book contains short versions of 13 lectures held on the Seminar 'Solar energy utilization by climate-adjusted planning and building' which took place on the 14. and 15th December 1981 in Berlin. Each lecture is dealt with in an individual abstract.

2600 (CONF-811288—, pp 47-59) **Calculation approaches for energy evaluation of buildings.** Rouvel, L. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Conventional calculation methods of energy consumption as contained in DIN 4108, the heat insulation ordinance or the VDI-recommendation 2067 are mainly concerned with the heat loss of buildings and may lead to wrong judgment, resulting in costly wrong investment in energy saving measures. Heat gain through insolation, lighting, man himself and thermal storage in building components must be considered. An approximation formula is given which takes the influence of outside temperature and those of the building into account. Energy evaluation of individual flats of a building is not considered to be sensible. The building should always be judged as a whole.

2601 (CONF-811288—, pp 61-63) **Thermal insulation ordinance and utilization of solar energy.** Kuenzel, H. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Thermal insulation and transition through outer building components is expressed by heat transition resistance and heat transition coefficient. Both parameters leave the factor of insolation out so it is not included in the present version of the ordinance. The planned updating should correct this by taking solar energy utilization by transparent and non-transparent components into account. Otherwise the gap between thermal insulation ordinance and solar energy utilization may widen.

2602 (CONF-811288—, pp 65-71) **Development tendencies of passive systems.** Lohr, A.W. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Many energy-saving measuring are not helpful in saving costs. This is also a basic danger of the passive systems. In order to solve the conflict one must switch from a heat-consumption calculation to an energy-balance calculation. For passive systems there its a number of optimisation parameters which have to be balanced, for example: reducing the thermal loss, increasing solar profit by legal standards and production development on the sectors thermal insulation, glazing, thermal loss through ventilation, increasing the storage capacity while reducing cost and weight of construction material, extending the possibilities of solar energy utilization and the lowest possible use of additional kinds of energy.

2603 (CONF-811288—, pp 73-78) **Present and future tendencies of window technique.** Seifert, E. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

The window as 'energy spendthrift' and the minimisation of window space, are tendencies which prevailed after 1973 but are now part of the past. The energy balance - the difference between possible energy gains and unavoidable loss - is decisive for energetic evaluation of glass components. The further development of window technology concentrates on three points: 1) direct energy gain by insolation 2) indirect gain by combining windows and storage elements for example the Trombe wall 3) winter gardens and solar green houses as passive solar collectors and thermal buffers. Furthermore details on development of frame material, -construction, insulation glazing and window coating are given.

2604 (CONF-811288—, pp 79-85) **Vegetation systems as components of buildings with passive energy systems.** Herzog, T.; Baumann, R.; Latz, P. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Vegetation systems may reduce undesired heating of light constructions buildings with passive systems of solar energy utilization. The choice of suitable plants has the additional effect of permitting - during winter - sufficient permeability for energy supply on the Southern- and Southwestern side of the building. Emphasis of the report lies on the research project 'Solar Greenhouse' in Kassel designed as detached small greenhouse geared to the needs of a larger family. The aim was to extend the vegetation period for production and pre-growing without spending fossile energy. Presently the project is evaluated.

2605 (CONF-811288—, pp 87-93) **Short description of the research project 'building and energy'.** Nikolic, V. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

The research project 'building and energy' aims at developing new energy-saving constructions for buildings. Dependencies of individual measures of construction, house technology and building organisation for the realization of this aim are analysed. Results: 1) energy balance of a room depends on the direction the room faces and the location within the building 2) energy balance of a room depends on the thermal quality of the outer wall and 3) on the size and thermal quality of the windows.

2606 (CONF-811288—, pp 95-97) **Transforming design concepts into energy-conscious architecture.** Faskel, B.G. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Energy will be an increasingly important planning factor in architecture; approaches are already noticeable. Glazed buffer zones and passive utilization of solar energy lead to considerable heat gain and may increase the quality of a building. To realize these advantages in new buildings, the subsidising practice/regulations have to be altered. Two examples of publicly subsidised buildings show that the present legislation on building/energy may be unfavourable to those who put energy saving by construction into practice.

2607 (CONF-811288—, pp 99-105) **Efficient energy use in area development planning - reducing heating energy need by measures of passive use of insolation.** Roth, U. 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From Seminar on solar energy utilization by climate-adjusted planning and building; Berlin, F.R. Germany (14 Dec 1981).

Design and arrangement of buildings are decisive factors for the extent of the 'passive' use of insolation for heating purposes. The German Act on building stipulates that energy- and heat supply have to be part of the area development planning, therefore a study was made of the climatic conditions of several settlement- and building types. From the results 12 rules are extracted for area development planning, one attempted to make a quantitative statement on the respective energy savings potential. These rules were put to test in an area planning scheme with 170 ha in a part of a city. Compared to the older development plan one achieved a saving potential of 25% while the space for buildings to be erected remained the same. Settlement planning is therefore vitally important for the development of energy-saving construction methods.

2608 **(DOE/CE/15095—4) Moisture and home energy conservation: how to detect, solve and avoid related problems.** (USDOE, Washington, DC). Sep 1983. 34p. NTIS, PC A03/MF A01. Order Number DE84002744.

The following topics are covered: why and where most moisture problems are likely to occur; symptoms, causes, and the range of possible solutions to excess moisture; techniques used to remedy moisture problems, including vapor retarders, ventilation, drainage improvements and basement and foundation treatments; and a generalized moisture audit methodology, including tests and tools needed for the job. (MHR)

2609 **(DOE/CS/20050—1) Tenant-paid energy costs in multifamily rental housing: effects on energy use, owner investment, and the market value of energy.** McClelland, L. (Colorado Univ., Boulder (USA). Inst. of Behavioral Sciences). Nov 1983. Contract AC02-77CS20050. 134p. NTIS, PC A07/MF A01. Order Number DE84002311.

Background figures on rental housing, past work, and several methods of billing tenants for energy costs are reviewed. The following are reported: the effect of tenant payment on short-term energy use, owner actions in properties with owner vs tenant energy payment, and the role of energy in the rental housing market. A model of owner-tenant interactions affecting energy use in multifamily buildings, and a method of estimating the long-term effects of tenant payment on energy use are presented. Implications of the findings for policies concerning utility payment modes and energy investments in rental housing are discussed. (MHR)

2610 **(DOE/CS/20177—T1) New York State Energy Office fuel-Oil Conservation Marketing Program. Final report.** (New York Energy Office, Albany (USA)). 1982. Contract FG01-79CS20177. 121p. NTIS, PC A06/MF A01. Order Number DE83015350.

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The Fuel Oil Conservation Marketing Program involved the US Department of Energy (DOE), the New York State Energy Office (NYSEO), and the Empire State Petroleum Association (ESPA). The program consisted of three phases, a pilot program which was held on Long Island in 1979-1980, a statewide training and promotional program which was in operation from September 1, 1980 through September 30, 1981 in conjunction with ESPA, and an additional training effort carried out in 1982 by NYSEO focusing on heating contractors and multifamily boiler-room operators. Over 898 servicers of oil-fired residential heating equipment were trained under the three phases of this program as well as 524 operators of boiler-rooms in multifamily housing. Energy savings for the first two phases of the program alone are estimated to be the equivalent of over 13,315,000 gallons of oil. Energy cost savings are estimated to be $17,176,350 through December 1982. The materials developed for the program are attached.

2611 **(DOE/CS/20271—2) Design methodology analysis: design and operational energy studies in a new high-rise office building. Volume 2.** (Tishman Research Corp., New York (USA)). Feb 1983. Contract AC02-79CS20271. 159p. NTIS, PC A08/MF A01. Order Number DE84002144.

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Work on energy consumption in a large office building is reported, including the following tasks: (1) evaluating and testing the effectiveness of the existing ASHRAE 90-75 and 90-80 standards; (2) evaluating the effectiveness of the BEPS; (3) evaluating the effectiveness of some envelope and lighting design variables towards achieving the BEPS budgets; and (4) comparing the computer energy analysis technique, DOE-2.1, with manual calculation procedures. These tasks are the initial activities in the energy analysis of the Park Plaza Building and will serve as the basis for further understanding the results of ongoing data collection and analysis.

2612 **(DOE/CS/20524—1-Draft) Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes.** (Winter (Steven) Associates, Inc., New York (USA)). May 1983. Contract AC01-79CS20524. 105p. D. Order Number DE84001739.

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A slide rule is provided which will give a highly accurate indication of the energy savings that can result from adding energy conservation options to the home. The following are covered: ceiling insulation, wall insulation, floor insulation, infiltration, windows, shading, movable insulation, equipment, fans, space conditioning, domestic hot water, appliances, economics, and estimating local energy costs. (MHR)

2613 **(DOE/CS/20524—2-Draft) Affordable manufactured housing through energy conservation: using the slide rule and modifiers.** (Winter (Steven) Associates, Inc., New York (USA)). May 1983. Contract AC01-79CS20524. 35p. NTIS, PC A03/MF A01. Order Number DE84001740.

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The slide rule is used to estimate energy savings for the following types of options: ceiling insulation, wall insulation, floor insulation, infiltration reduction, window characteristics, and equipment efficiency. The modifiers are additional energy conservation options whose savings are estimated using tables contained in this booklet. These options include: heat absorbing and reflective glazing, movable insulation, night setback thermostat, roof color, and whole house fan. (MHR)

2614 **(DOE/CS/20524—4-Draft) Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices.** (Winter (Steven) Associates, Inc., New York (USA)). May 1983. Contract AC01-79CS20524. 409p. NTIS, PC A18/MF A01. Order Number DE84001742.

Data are presented on changes in heating or cooling load with changes in: insulation and infiltration, windows, movable insulation, roof color, and control strategies. (MHR)

2615 **(DOE/CS/20524—5-Draft) Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes.** (Winter (Steven) Associates, Inc., New York (USA)). May 1983. Contract AC01-79CS20524. 133p. NTIS, PC A07/MF A01. Order Number DE84001743.

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The methodology is reviewed. The work on a simulation tool to perform the building energy analysis work is discussed. The derivation of the operational aspects of the prototype homes is described including thermostat settings, venting schedules, and internal load parameters. The approach developed to estimate the energy savings associated with the energy conservation options, the results of the analysis and the conclusions derived from the data are delineated. The slide rule is introduced as a format for displaying the data correlated by the sensitivity analysis. The procedures developed for estimating energy savings resulting from the use of two types of options: active solar panels and flow reducers, are outlined. (MHR)

2616 **(EUR—8506-EN) Basic characteristics of low-cost houses in order to reduce the energy consumption for heating: efficiency of heating plants and controls. Final report, January 1978-September 1980.** Rayment, R.; Cunliffe, A.R.; Morgan, K. (Building Research Establishment, Watford (UK)). 1983. 256p. European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

In a study of room-thermostat and thermostatic radiator valve control it is demonstrated, that for the occupancy behaviour and type of house tested that room-thermostat is as effective as thermostatic radiator valve control. Generalization of the result is subject to a number of important qualifications. Considerable technical advances have been made, however, for the practical evaluation of heating systems and controls. These are: development of a matched house pair technique for the on-site evaluation of heating systems and controls, with simulated occupancy; development of a gas boiler test rig capable of continuous measurements of energy flows to the circulating water and through the flue: thus enabling the transient and steady states to be investigated; and development of two computer models: one for a heating appliance and one including additional simulation of a hot water radiator and temperature controls within a simple representation of a building, and further work is required to draw the full benefits from these.

2617 **(EUR—8787-DE) Optimization of a combustion motor driven heat pump (gas/oil) for power ranges up to 20kW thermal with variable sources of environmental energy in one- and two-family-houses (small heat pump).** Lueck, K. (Technische Hochschule Aachen (Germany, F.R.)). 1983. 65p. (In German). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

An IC-engine-compressor-unit particulary designed as driving unit for the operating requirements of heat pumps was developed. It can be operated either by mean of natural gas or by fuel oil. In conjunction with the microprocessor control, designed for that very purpose, the heating capacity of the heat pump will be controlled depending on both the outside temperature and the heat demand of the house by speed control of the engine as well as by turning on and off cylinders of the two-cylinder-compressor. For the purpose of testing and optimization three heat pumps were installed in the R and D department, eight heat pumps were installed in private houses of members of the enterprise and in addition one fuel oil and one gas heat pump were installed for heating purposes of the research department. The results show, that the expected data regarding power output and the ability to integrate the IC driven heat pump in an existing heating system were reached, but seasonal performance factors (SPF) and some waste gas emissions are still not in accordance with the research targets. The results and findings of our research and development program were the basis for the improvement of the main components of the IC-driven heat pump: engine, compressor, the environmental energy source and the electronic control devices.

2618 **(KTM/E-D—22) Energy conservation of ventilation in commercial and public buildings. Basis. Method file.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1983. 133p. (In Finnish). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751450.

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The aim of this study is to find ways of reducing ventilation energy consumption in commercial and public buildings. The estimation process developed in this study makes it possible to quickly recommend measures to reduce ventilation energy consumption in a building, using the method file. The method file, made up of different measures for 16 type situations, was developed for the estimation process. It makes the estimating of energy savings, costs and therefore cost benefit easy and quick. Each measure is described briefly in the method file. Different people that are to be involved (engineers, contractors, authorities etc.) are specifically mentioned. A diagram of the relationships between the client and other parties is also presented. The effects of the executed measures on energy consumption are presented in the form of curves or histograms. In the estimating process, the effects of the possible methods on energy consumption and their costs are worked out. In this way, both maximum savings and an estimation of the investment are obtained. After this, a cost benefit study of the measures is made by first working out the pay-back period and the rate of return. Using these figures, the measures can be set in order of priority and the measures to be carried out can be selected.

2619 **(N—8325069) Metal-hydride heat-pump performance studies.** Abelson, H.F.; Clinch, J.M. (Argonne National Lab., IL (USA)). Feb 1982. 7p. (CONF-810940—). NTIS, PC A17/MF A01.

From Annual contractors' review meeting on thermal and chemical storage; Tysons Corner, VA, USA (16 Sep 1981).

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 115-121 (SEE N83-25057 14-44).

Expressions for the coefficient of performance (COP) were developed for both heating and cooling by a multi-tube, metal-hydride heat pump that employs regenerative heat exchange. Theoretical upper bounds on the COP were established and the sensitivity of the heating COP to variations in key system parameters was determined. The COP was estimated for a baseline design and potential design improvements were explored.

2620 **(N—8325073) Assessment of cool storage in commercial building applications.** Asbury, J.G.; Calm, J.M.; Giese, R.F. (Argonne National Lab., IL (USA)). Feb 1982. 9p. NTIS, PC A17/MF A01.

In Proc. of the 6th Ann. Thermal and Chem. Storage Contractors' Rev. Meeting p 166-175 (SEE N83-25057 14-44).

As part of its storage assessment program, Argonne National Laboratory is evaluating cool storage technologies for electric load leveling in commercial building applications. Analysis of conventional chilled water and ice storage systems indicate that paybacks of less than four years are available under the partial storage, or load leveling, mode of operation. Storage systems with sufficient capacity to eliminate on-peak chiller operations entail larger initial capital outlays and longer paybacks under existing commercial-class electric rate schedules. Improved performance and lower costs could be achieved through R and D to improve the match between the storage and the chiller systems and through development of improved latent heat systems.

2621 **(NP—3770412) Design of compression heat pumps driven by diesel engines for domestic heating systems.** Schulte, H. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 15 May 1981. 168p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83770412.

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Description of experimental investigation and simulation computing on design, operational mode pollutant- and noise emission and control of diesel-engine driven compression heat pumps for consumers with a heat demand below 100 kW. Especially monovalent operation with speed control and utilization of the heat source "air" are considered. Representative operational data of smaller diesel-engines, piston-refrigerant compressors and the diesel-heat pump itself are given and compared - if available - to data quoted in literature.

2622 **(NP—4900033) Residential conservation demonstration program. Final report.** (Florida Public Service Commission, Tallahassee (USA)). Jan 1983. 160p. NTIS, PC A08/MF A01. Order Number DE84900033.

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Findings and conclusions from the RCD Program are based on the results of eight field test demonstration projects conducted by investigators from university and private research groups and staff technical research activities. These efforts produced actual Florida-specific data and information on the performance of selected conservation options and reviewed and synthesized current conservation literature applicable to issues and needs in the Florida residential sector. The following are reported here: program overview, field test demonstration projects, summaries of technical papers, and RCD program findings and conclusions. (MHR)

2623 **(NP—4900134) Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program.** Lawrence, W.T. (Little (Arthur D.), Inc., Cambridge, MA (USA)). [nd]. 121p. NTIS, PC A06/MF A01. Order Number DE84900134.

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Field tests of various combinations of electric, energy conserving appliances were conducted in 16 homes in Orlando and 12 homes in Miami. The appliances tested were central air conditioners, ceiling fans, heat pumps, heat recovery water heaters, dedicated heat pump water heaters, and refrigerators. The purpose of the tests was to measure the actual reduction in energy use associated with various combinations of conserving appliances. With the exception of the refrigerators, all tests were conducted with both a conventional unit and a high efficiency unit in parallel in each test site. These were used alternately on a weekly basis so that energy use for baseline and high efficiency units was measured in the same house with the same family. In addition, in each city, the houses were in a development of similar houses. Roughly half the homes had high efficiency refrigerators. The tests ran from January through August of 1982. Results show significant variations from house to house with the same appliance and a reduction in enegy use with the efficient refrigerators, heat pump water heaters, and air conditioners. Results for ceiling fans showed no savings for the average of all the sites although those sites which had larger than average air conditioning loads had significant savings. Heat recovery water heater tests showed savings in Miami where new heat recovery units were installed for testing. At the sites in Orlando where existing heat recovery units which had been in service for 2 to 5 years were tested as installed no savings were found. Heat pump tests were inconclusive due to limited data.

2624 **(NP—4900240) Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report.** Messenger, R. (Florida Atlantic Univ., Boca Raton (USA). Center for Energy Conservation). 1 Oct 1982. 174p. NTIS, PC A08/MF A01. Order Number DE84900240.

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The results of retrofitting 25 dwellings in Palm Beach County, Florida to achieve maximum cost effective electric energy savings are described. A total of $144,932 was spent on air conditioners, solar water heaters, heat recovery units, insulation, refrigerators, ceiling fans and other equipment and envelope upgrades. Only equipment readily available in the market place was used. Equipment was selected on the basis of the results of an energy audit showing a favorable internal rate of return on the investment. For the first six months of data collected, average weather corrected KWH savings have ranged between 24 and 33%.

2625 **(NP—4900253) In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program.** Eno, B.E. (University of Central Florida, Orlando (USA)). 1982. 68p. NTIS, PC A04/MF A01. Order Number DE84900253.

A field experiment was carried out to examine the relative advantages of air-conditioning heat recovery units (HRU's) and dedicated heat pump water heaters (HPWH's) as energy conservation devices. HRU's were retrofitted to six central Florida residences, three of these with additional 80-gallon preheat water storage tanks. The other three residences were equipped with HPWH's which could be operated alternatively to the HRU's. The systems were instrumented with Btu meters and kWh meters to measure the required water heating energy, the energy supplied by either the HRU or HPWH, and the energy provided as backup to either the resistance coils or the HPWH. Data was logged on magnetic tape every 15 minutes and computer interpreted for analysis. The method of installation and the modes of operation are discussed. Problems with the energy conservation equipment and the instrumentation are reported. Results are presented in terms of daily distributions of energy supplied, energy use, and energy saved for water heating in each of the six residences. Hourly distributions of energy required and HRU supply are provided to allow examination of the time-wise mismatch between air-conditioning waste heat availability and hot water demand. Projections of annual energy savings are made and suggestions for maximizing the performance of the HRU's are discussed. A simple payback analysis is done on the HRU's and HPWH's based upon observed performance, present day installed costs, and cost of displaced electricity.

2626 **(NYU/DAS—80-20) Experimental investigation of fuel vaporization on combustion efficiency.** Zakkay, V.; Agnone, A.; Clisset, H. (New York Univ., NY (USA). Dept. of Applied Science). Dec 1980. Contract AC22-77ET11283. 47p. (CONF-810621—7). NTIS, PC A03/MF A01. Order Number DE84000358.

From Symposium on fluid mechanics of combustion systems; Boulder, CO, USA (22 Jun 1981).

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The development of a residential size vaporizing oil burner is presented along with its operational and performance characteristics. The vaporization scheme consists of spraying No. 2 oil onto a regeneratively heated surface at a temperature above the oil vaporization temperature (650°F). The vaporized oil mixes with a preheated air (T = 250°F) stream to produce a uniform fuel air mixture. The premixed vaporized fuel/air stream produces short blue flamelets anchored to a steel screen flame holder. The operational and performance characteristics of this burner are presented for a range of the air and oil flow parameters around the stoichiometric condition, and for a nominal firing rate of $\leqq$ 1.2 gph. Operation with less than 3% excess air is demonstrated with very little soot formation. The combustion quality of the vaporizing oil burner is substantially improved compared to conventional spray combustion and recirculation type blue flame burners. The vaporizing oil burner was adapted to a conventional boiler and the thermal efficiency was determined by a calorimeter technique and compared to the stack method. The thermal efficiency with the vaporized combustion mode is about 4% greater than conventional spray combustion burners. The increase is realized through the reduced excess air requirements. The increased efficiency can result in reduced oil consumption from 12% to 20% depending on the location and usage of the burner unit.

2627 **(ORNL/CON—118) Verification of the DOE Model Audit.** Stovall, T.K. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE84002989.

The Department of Energy (DOE) Model Audit is a residential audit procedure provided by DOE as a part of the Residential Conservation Service technical assistance to states. A verification procedure was developed for comparison of the DOE Model Audit with a collection of energy consumption data for six houses and with the DOE2.1A computer code. The Model Audit's heating energy consumption estimates were very good. However, these estimates were very sensitive to the infiltration rates. The Model Audit cooling estimates were consistently higher than the measured consumption. The cooling algorithms require significant improvement.

2628 **(ORNL/CON—142) Comparison of actual electricity savings with audit predictions in the BPA residential weatherization pilot program.** Hirst, E.; White, D.; Goeltz, R. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE84002991.

The BPA program offered free home enrgy audits to identify cost-effective conservation measures to reduce space and water heating electricity use. The program also offered zero-interest, deferred-payment loans for installation of measures recommended during the audit. The data analyzed here, available for about 250 homes that received both an audit and a loan between April 1 and

October 1, 1981, include actual electricity consumption records for a heating season before retrofit (1980/81) and a heating season after retrofit (1981/82). In addition, daily temperature data for relevant weather stations, energy audit reports, weatherization completion forms, and information from a telephone survey on household demographic and structure characteristics are also available. Thus, the data set encompasses information related to actual electricity savings, audit predictions of that saving, actual retrofit costs for the measures installed, and information on several factors related to household electricity use and savings. The actual reduction in annual electricity use averages 4130 kWh across the participant households. The cost of the retrofits that yielded this saving averaged $2100. The median ratio of actual-to-estimated saving is 0.66. Thus, on average, two-thirds of the expected saving is actually realized. However, there is substantial variation in this ratio. Actual electricity use increases in the second year for more than 10% of these homes. On the other hand, actual savings are more than double the audit estimates in more than 10% of the homes.

2629 **(ORNL/Sub—80-7800/2) State-of-the-art survey of existing knowledge for the design of ground-source heat pumps.** Ball, D.A.; Fischer, R.D.; Talbert, S.G.; Hodgett, D.; Auer, F. (Battelle Columbus Labs., OH (USA); Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Nov 1983. Contract W-7405-ENG-26. 85p. NTIS, PC A05/MF A01. Order Number DE84002988.

The objectives of the program reported here were to gather design and performance information on historical and current ground-coil heat-pump systems, to assess the adequacy of available design methods, and to define near-future R and D needs to promote the use of this technology. The project was generally separated into two parts: (1) a review of the North American technology conducted by Battelle-Columbus, and (2) a review of European technology conducted by Battelle-Frankfurt. Descriptions of basic ground-coil design configurations, operating experience, design methodologies, and reviews of costs of existing installations are included. It is found that further design-method developent efforts are necessary to provide installers and manufacturers with pertinent design information in order to stimulate further implementation of ground-coupled heat pumps in the United States. Furthermore, a research effort is needed to develop parametric data on the design and performance of a ground-coil during cooling using heat and moisture models.

2630 **(PNL—4179) Residential conservation investments: a practical guide to retrofitting.** Rothchild, J.; Nieves, A.L. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1983. Contract AC06-76RL01830. 58p. NTIS, PC A04/MF A01. Order Number DE84003341.

Some topics covered are: how to rate your house and yourself as energy users; testing your house for leakiness; managing the temperature setting, air flows, water use, and windows. Cures for a leaky house are discussed by location: attic, interior walls, exterior walls, heating and cooling ducts, basement and water heater. Methods of assessing the investment options and evaluating the big purchases are discussed. (MHR)

2631 **(VTT-TIED—187) Energy economical improvement of an oil heating system.** Korhonen, R. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Feb 1983. 42p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The traditional heating economy test of a small oil-fired boiler is basically to measure the burning efficiency. In the advanced heating economy test the main result is the annual efficiency which describes better the yearly energy consumption. In laboratory conditions similar tests have been made in the past few years. The advanced heating economy test gives the information needed for calculations concerning the profitableness of different kinds of improvements in the field conditions. As a test group there are 41 small houses in Helsinki area in which measurements have been made. The average annual efficiency was shown to be 69 per cent. After that heating systems were improved in various ways like adding insulation to the boiler, changing the burner etc. The final results and oil savings will be available in autumn 1983. The evaluations show that the annual efficiencies should rise approximately 10 per cent.

2632 **(VTT-TIED—216) Energy economy of underground spaces and heat storage in bedrock.** Ritola, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 101p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The first part deals with energy economic possibilities of using bedrock for alternative solutions to building above ground. Estimated building and operating costs of rock caverns and tunnels for different purposes are compared with those of corresponding facilities above ground. Special attention is paid to the consumption of heating energy. The second part deals with exploitation of the thermal energy of bedrock, geothermal energy and seasonal heat storage in bedrock, which presumes large storage volumes. For the seasonal storage current storage methods and different constructions of storages are presented. Construction costs and heat storage costs are estimated on the basis of cost data obtained from existing heat storages and calculations presented in literature. In addition, priciples for design of heat storage in bedrock and thermal properties of rock are discussed.

2633 **(VTT-TUTK—152) Intermittent heating of buildings.** Kohonen, K. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Feb 1983. 121p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Conditions for intermittent heating of buildings are considered both theoretically and experimentally. Thermal behaviour of buildings adn rooms in intermittent heating is simulated by a program based on the convective heat balance equation and by simplified RC-models. The preheat times and the heating energy savings compared with continuous heating are presented for typical lightweight, mediumweight and heavyweight classroom and office modules. Formulaes for estimating the oversizing of the radiator network, the maximum heat output of heat exchangers in district heating and the efficiency of heating boilers in intermittent heating are presented. The preheat times and heating energy savings with different heating control systems are determined also experimentally in eight existing buildings. In addition some principles for the planning and application of intermittent heating systems are suggested.

2634 **(VTT-TUTK—168) Transient analysis of the thermal and moisture physical behaviour of building constructions.** Kohonen, R.; Meaettae, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Mar 1983. 77p. Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Constitutive equations for simultaneous heat and mass transfer in porous material are derived from the integrated mass, momentum and energy balance equations using the averaging divergence theorem. The temperature and moisture content are used as independent variables. In the energy balance equation the conduction, convection and accumulation of heat and heat source due to phase changes are considered. In the moisture blance equation the accumulation of moisture, the diffusion flow of water vapour, the capillary flow of liquid water and the viscous flow of humid air and water are considered. The boundary layer and interfacial balance equations are derived. For transient analysis of the moisture physical behaviour of multilayer constructions a numerical algorithm and a computer program based on the Crank-Nicolson method and quasi linearizitation is formulated. Some example calculations are presented to illustrate the computer program. The accurace of the the numerical algorithm compared with the analytical solution for a semi-infinite body is presented.

2635 **Evaluation of an air-to-air heat exchanger.** Persily, A. (Princeton Univ., NJ). *Environment International;* 8: No. 1-6, 453-459(1982). (CONF-811048—). Contract AC02-77CS20062.

From International symposium on indoor air pollution, health and energy conservation; Amherst, MA, USA (13 Oct 1981).

A room-size, residential air-to-air heat exchanger was tested for effectiveness of heat recovery. The experiments were conducted in a small (16.6 $m^3$), wood frame building, the Test Chamber, on the roof of a laboratory building. The Test Chamber is a controlled and instrumented structure for which we have the ability to predict within 1% the heat loss rate over a 6-h nighttime period. With the

heat exchanger installed and operating in the Test Chamber, the heat recovery efficiency was determined by comparing the actual heat loss to that expected due to the mechanically induced ventilation. The heat exchanger recovered almost 50% of the heat contained in the outgoing air flow. Additional experiments quantified effects of fan power consumption and heat conduction through the case of the device. By considering these effects, we determined that the heat exchanger itself works at an efficiency less than the manufacturer's claim. Conducting the experiments in a real building has provided insights and evaluations not possible in an indoor laboratory.

2636 **Ventilation for control of indoor air quality: a case study.** Janssen, J.E. (Honeywell, Inc., Minneapolis, MN); Hill, J.J.; Woods, J.E.; Maldonado, E.A.B. *Environment International;* 8: No. 1-6, 487-496(1982). (CONF-811048—).

From International symposium on indoor air pollution, health and energy conservation; Amherst, MA, USA (13 Oct 1981).

Dilution of indoor air contaminants with less contaminated outdoor air is the most common strategy for control of indoor air quality. Unfortunately this strategy frequently imposes a substantial energy burden. If the contaminants are associated with occupants and their activities, a ventilation control system based on the carbon dioxide level in the controlled space is shown to relieve this energy burden. A test was carried out in the Fridley, MN, Junior High School Music Department to obtain air quality, energy, and subjective response data on an Automatic Variable Ventilation System. A control system with both $CO_2$ and temperature inputs was devised to control the use of outdoor air. Infiltration measurements lead to a quantitative measure of ventilation efficiency. This in turn led to recommendations for air circulation patterns in rooms. The measured ventilation efficiency enabled energy and $CO_2$ models to fit measured data. Energy savings of approximately 20% were found for this application. Subjective response of the occupants also was measured. A special questionnaire, subjected to statistical analysis, showed that the subjects felt warmer with increased $CO_2$ in the room air.

## 3202 Transportation

*REFER ALSO TO CITATION(S) 2543, 2637*

2637 **(DOE/R4/10154—T1) Demonstration and evaluation of plastic bag streamlining on highway trucks for drag reduction and energy savings. Final report.** Carden, A.E. (Alabama Univ., University (USA). Dept. of Mechanical Engineering). Mar 1982. Contract FG44-80R410154. 12p. NTIS, PC A02/MF A01. Order Number DE84000763.

Highway tests on a tractor-trailer with and without a rear-door drag reduction device have demonstrated a 13 horse-power savings for an 88" x 94" rear door at a vehicle speed of 55 mph. Greater savings would be realized for larger trailer door sizes and higher highway speeds. Implementation of such devices on high-use vehicles would provide a payback period of less than a year for installation of rear-door drag reduction devices.

2638 **(N—8326760) An investigation of the internal and external aerodynamics of cattle trucks. Final Report.** Muirhead, V.U. (Kansas Univ. Center for Research, Inc., Lawrence (USA)). May 1983. 87p. (NASA-CR—170400). NTIS, PC A05/MF A01.

Wind tunnel tests were conducted on a one-tenth scale model of a conventional tractor trailer livestock hauler to determine the air flow through the trailer and the drag of the vehicle. These tests were conducted with the trailer empty and with a full load of simulated cattle. Additionally, the drag was determined for six configurations, of which details for three are documented herein. These are: (1) conventional livestock trailer empty, (2) conventional trailer with smooth sides (i.e., without ventilation openings), and (3) a stream line tractor with modified livestock trailer (cab streamlining and gap fairing). The internal flow of the streamlined modification with simulated cattle was determined with two different ducting systems: a ram air inlet over the cab and NACA submerged inlets between the cab and trailer. The air flow within the conventional trailer was random and variable. The streamline vehicle with ram air inlet provided a nearly uniform air flow which could be controlled. The streamline vehicle with NACA submerged inlets provided better flow conditions than the conventional livestock trailer but not as uniform or controllable as the ram inlet configuration.

2639 **(VTT-TIED—159) Energy efficiency of different modes of goods transport.** Kallberg, H. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Nov 1982. 70p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The energy consumption of different modes of goods transport is studied. The modes are trucks, vans, railways, floating and coastal vessels. Literature gives varying information about fuel consumption of the trucks. It is evident that the characteristics of the engine, transmission and coachwork, driving habits and the road environment can substantially influence fuel consumption. In every case the vehicle mass has a considerable effect on fuel consumption. In long distance truck transport the fuel consumption per net ton mileage can vary about 50% depending on the type of goods. For vans the fuel consumption per net ton mileage is very hugh compared with trucks. The fuel consumption of a goods train is dependent on the power source (electricity or diesel) and on the train weight. Electric power is more favourable even though electricity is calculated to be transformed from oil with a net gain of 35%. Floating and coastal vessels proved to be the most energy economical in this comparison. The specific fuel consumption values of different modes per net ton mileage for different types of goods are presented in the nest table. The values are calculated in kg of crude oil. The original fuel consumption values of the vehicles are corrected with raffinery and energy transport losses. The values represent short-term variable fuel consumptions, and thus they do not include fuel costs caused by building and maintaining transport routes or the fuel bound in the vehicles. The differences in transport distances must be considered in further comparison between transport modes.

2640 **(VTT-TIED—160) Energy efficiency of different modes of person transport.** Kallberg, H. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Nov 1982. 74p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The energy consumption in person transport is studied in the modes of private cars, taxis, buses, trains and aeroplanes. The total fuel consumption of the person car park can be deduced from the ECE-15 test results by making temperature and load corrections and weighing the results of urban cycle, 90 km/h and 120 km/h with 30%, 60% and 10%. The fuel consumption of taxi traffic per person km is higher than that of private cars because of the lower load factor. A model has been developed for the fuel consumption of long distance buses. The fuel consumption in the model is dependent on the height differences on the route, the number of passengers and the mean interval of stops. For urban buses the mean interval of stops and the number of passangers are determining the fuel consumption. The fuel consumption of an express train is dependent on the number or wagons, the number of passangers and the type of engine power (diesel or electric). The energy consumption of the local trains is very dependent on the season, because of the major role of the heating energy. In air transport the fuel consumption per distance unit is dependent on the flight distance. For the comparison of different modes the fuel consumption values have been transformed into crude oil kg's by making corrections for raffinery process and fuel transport. Additionally corrections to direct in-use fuel consumption of vehicles are made for the auxiliary operations of vehicles. The value of fuel needed in the building and maintenance of transport routes and bound in the vehicles is not calculated.

2641 **(VTT-TUTK—159) Traffic impacts and energy consumption in urban areas.** Himanen, V. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Mar 1983. 92p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

In this study the question how to consider energy economics in urban traffic planning is to be clarified. The aim has been to develop a system, which gives a reasonable way to consider energy consumption when evaluating traffic plans. The main part of the study is of the relationships between the traffic impacts and espe-

cially of the relationships between energy consumption and other impacts. Also energy consumption and its relationship to other traffic impacts has been estimated in some Finnish cities. There is no universal method to evaluate traffic plans. Therefore an evaluation method has been developed in the study. The method can generally be used in urban traffic planning. The study has been limited to urban passenger traffic because of the available resources. Energy consumption can be considered at three levels: local, national and global. At the local level energy consumption is felt indirectly as mobility, risk, environmental impact and cost. Decisions on traffic engineering can be made on the basis of these items. Energy consumption as a separate criterion is not needed. In the study an evaluation method for traffic plans is developed. The method uses mobility, safety, environmental effects and use of money as the criteria. The evaluation includes both objective and subjective knowledge and various viewpoints. The viewpoints include traffic users, and the inhabitants and enterprises in the area.

2642 **(VTT-TUTK—169) Fuel and tyre costs and driving comfort on the surface dressing.** Sistonen, M.; Laitinen, L.; Seise, A. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Mar 1983. 50p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The effects of a surface dressing with chippings on traffic costs and on riding comfort were studied by comparing it to asphalt concrete. As to these effects, asphalt concrete can be regarded equal to thinner layers of asphalt concrete masses. The chippings in the surface dressing were made of crushed stone, its particle size was mainly 14-20 mm. Asphalt concrete 25 was used as a reference surfacing. The variables of comparison were fuel consumption, wear of tyres, noise inside the vehicle, rolling resistance, coarseness of pavement surface and longitudinal evenness. The measurements were carried out so that the results represent average properties of the pavement during the first two years. The testing vehicle was a passenger car. The fuel consumption on a surface dressing with chippings was 6% higher and the wear of tyres 69% higher than on asphalt concrete. The increase of rolling resistance was 19%. The surface dressing with chippings was calculated to increase fuel and tyre costs by 0.039 FIM/km. The increase of costs during the two first years is 4 FIM per square meter of pavement per traffic amount of 1000 vehicles/day. The driving comfort is poorer on surface dressing with chippings than on asphalt concrete. The noise inside the car at a speed of 80 km/h was 71 dB (A) on asphalt concrete and 76 dB (A) on surface dressing with chippings. The unevenness value was 160 cm/km on asphalt concrete and 193 cm/km on surface dressing with chippings. The results of this investigation tally with most research results given in literature.

## 3203 Industry And Agriculture

*REFER ALSO TO CITATION(S) 1878, 2071, 2073, 2086, 2548, 2548, 2585, 2585, 2657, 2657*

2643 **(DOE/CE/15146—T3) Microwave methods and apparatus for paving and paving maintenance. Final report on Phase I.** Jeppson, M.R. (Jeppson (Morris R.), Carmel, CA (USA)). 24 Jul 1983. Contract FG01-82CE15146. 13p. NTIS, PC A02/MF A01. Order Number DE83016306.

An MPH strip-patcher-recycler eliminates most of the conventional patching equipment, operators and the hot-mix plant, and should reduce costs dramatically. In practice the MPH machine simply drives along over the damaged strip heating it in-place with microwave; roto-mixing it while injecting hot engine exhaust and make up asphalt or conditioners; screening and tamping. A follow up roller completes the job. Traffic control is simpler and work can be performed in cold or damp weather, and more easily at night - if necessary. The design and operation of the MPH machine are described.

2644 **(DOE/CS/15061—T1) Method of preserving fruits and vegetables. Final report.** (Bedrosian and Associates, Alpine, NJ (USA)). [nd]. Contract FG01-81CS15061. 4p. NTIS, PC A02/MF A01. Order Number DE84001805.

A low oxygen food preservation system was proven to be an effective replacement for refrigeration in the distribution and marketing of tomatoes. In addition to conserving energy, the low oxygen system delivers a better tasting tomato with longer shelf life and less spoilage. The system is now being used on a commercial basis in the United States and approximately 25,000,000 lbs or 700 truckloads will be shipped in 1983. The low oxygen system was also found to benefit other fruits and vegetables, but more work needs to be done before commercial shipments of other fruits and vegetables can be made.

2645 **(DOE/CS/15066—T1) Test results of Thermal Ice Cap prototype and final comments. Final report.** Burley, W. (T.I.C. Enterprises, Johnstown, PA (USA)). 1982. Contract FG01-81CS15066. 26p. NTIS, PC A03/MF A01. Order Number DE84002071.

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The design and testing of an insulating cover, Ice Cap, for an ice rink are described. The radio-controlled reel system which houses, deploys, and harvests the 17,000 square feet of insulating material is essential to the success of the cover. Photographs showing the use of the system are included. (MHR)

2646 **(DOE/CS/24315—20) Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981.** Renard, M.L. (National Center for Resource Recovery, Inc., Washington, DC (USA)). Oct 1983. Contract AC03-80CS24315. 64p. NTIS, PC A04/MF A01. Order Number DE84002608.

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The report reviews work performed by NCRR under DOE contract, from April 1980 to July 1981, to further understand and obtain reliable data on the design, operation and performance of rotary screens (trommels) using municipal solid waste (MSW) or its fractions as feedstocks. Such a review was deemed useful in view of the sudden termination of investigations at the Center, which ceased operations in September 1981. A description of contents and comments are given on each of eight reports written as interim documents or final test reports by NCRR and its subcontractor, the Warren Spring Laboratory of the UK Department of Industry in Stevenage, Great Britain. Full-scale tests at New Orleans, LA, Doncaster, Byker, and Stevenage (UK), conducted on trommels of different geometric or dynamic characteristics, are analyzed. It is shown that a fair degree of correlation exists between the modeling and theoretical work pursued under the contract and experimental observations. The same comment applies to the corroboration of theory with experimental data obtained at laboratory scale at the NCRR Resource Recovery Laboratory in Upper Marlboro, MD. The present report introduces a number of suggested calculation procedures which should prove helpful in the design of trommels and the prediction of their performance as screening devices operating on municipal wastes and its processed fractions.

2647 **(DOE/CS/50007—T2) Impacts of alcohol fuels on the US refining industry.** Dickson, J.C.; Frederick, F.P.; Sipowicz, W.W. (Bonner and Moore Management Science, Houston, TX (USA)). Aug 1983. Contract AC01-81CS50007. 306p. NTIS, PC A14/MF A01. Order Number DE84002903.

The impact of alcohol fuels, as a vehicle fuel or as fuel components on the US petroleum refining industry is assessed. An executive summary, details of methods, approach and result, and a series of appendices containing supporting information used in the study are included. (MHR)

2648 **(DOE/ET/13148—2) Direct combustion of industrial dry, composite waste in suspension. Final report.** (Peabody-Gordon-Piatt, Inc., Winfield, KS (USA)). Jan 1983. Contract AC03-78ET13148. 139p. NTIS, PC A07/MF A01. Order Number DE84002701.

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The program called for PG-P to find a Host at whose plant an existing oil and/or gas burner would be replaced with a burner that used on-site generated dry, composite waste. No suitable Host was found that was willing to commit to the required capital investment (approximately $740,000 for a 2000 PPH suspension burning retrofit). The resistance to investment of capital is considered to

be a reflection of both the recession and the need for additional R and D. In order that the objective might still be met, PG-P studied the feasibility of revising its existing Test Facility to perform as the Host. This would have involved significant additions to the facility, arrangements with off-site sources of waste fuel, etc. The study revealed that the estimated costs associated with such reorientation were greater than the remaining DOE funds and, in addition, required a sizeable capital investment by PG-P. The decision was made to terminate the contract in an action agreed upon on 20 October 1982 by both DOE and, PG-P. The report contains significant information generated as a result of the study to upgrade the test facility. Capital costs, fuel savings, payback and return on investment are reported for various retrofit systems.

2649 **(EGG-M—03283) Catalytic distillation: a government-industry success story.** Mings, W.J.; Massey, R.G. (EG and G Idaho, Inc., Idaho Falls (USA); Department of Energy, Washington, DC (USA). Office of Industrial Programs). 1983. Contract AC07-76ID01570. 20p. (CONF-831063—7). NTIS, PC A02/MF A01. Order Number DE84002766.

From American Institute of Chemical Engineers fall annual meeting; Washington, DC, USA (30 Oct 1983).

A cooperative industry/government cost-shared project is described which resulted in the development of an energy-efficient chemical process. Two small Houston, Texas companies have developed an energy-saving Catalytic Distillation process. This process uses a patented catalyst support system to permit a catalytic reaction and a primary fractionation of reaction components simultaneously in one vessel. As a result, one can achieve essentially 100% conversion of an equilibrium reaction in one process step. This process has been installed in a petroleum refinery to produce methyl tertiary butyl ether (MTBE), a high octane gasoline blending component formed by combining methanol (MeOH) with isobutylene. The production unit has operated for over two years producing about 1400 BPD of MTBE and is currently demonstrating a net process energy savings of about 25% over a conventional production method.

2650 **(FFI/Notat—80/4041) Charcoal based $CO_2$-generator for use in greenhouses.** Soma, M. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Jul 1980. 25p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751472.

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Plant production in greenhouses in Norway is a very energy demanding activity and possible methods to reduce the energy consumption have been studied. In principle one has three possibilities: improve the efficiency; use alternative energy sources or to increase plant production without increasing the energy consumption. Charcoal is as an energy source, a little more expensive than oil today. But charcoal has some favourable qualities and special possible uses in greenhouses. Besides supplying greenhouses with heat, it is possible to utilize the clean exhausts in increasing the $CO_2$ concentration in the greenhouse atmosphere and this way increase the plant production. The work presented is part of a project: $CO_2$ and heat from charcoal-possible application in greenhouses in Norway. This note discusses a pilot plant based on firing with charcoal where the exhaust gases are mixed with air and conducted to the growing cabinet in order to examine any harmful effects of the crops. 12 drawings, 2 tables.

2651 **(FFI-TN-VM—381) Charcoal for warming and $CO_2$-supply in greenhouses - possible use.** Throndsen, T. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Dec 1979. 13p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751473.

The work presented is part of a Norwegian energy concervation project: $CO_2$ and heat from charcoal - possible applications in greenhouses. Charcoal is as an energy source, a little more expensive than oil today. But charcoal has some favourable qualities and special possible uses in greenhouses seen from a economical point of view. Besides supplying greenhouses with heat, it is possible to utilize the clean exhausts in increasing the $CO_2$ concentration in the greenhouse atmosphere and thus increase the growth. Charcoal is a favourable raw material for this $CO_2$-production since the exhaust from the combustion of charcoal has probably much lower contents of harmful gases than alternative $CO_2$-sources like propane and paraffin. 1 drawing, 2 tables.

2652 **(FFI-TN-VM—382) Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments.** Throndsen, T. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Dec 1979. 9p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751474.

Charcoal has some favourable qualities and special possible uses in greenhouses seen from a economical point of view. Besides supplying greenhouses with heat, it is possible to utilize the clean exhausts in increasing the $CO_2$-concentration in the greenhouse atmosphere and thus increase the growth. The work presented is part of a project: $CO_2$ and heat from charcoal-possible applications in greenhouses in Norway. The conclusion in this note is that charcoal as an energy source, is more expensive than oil. $CO_2$ from charcoal and paraffin is cheaper than $CO_2$ from propane and gas containers. The combination of fuel oil and $CO_2$-generation from charcoal or paraffin, will give the lowest raw material costs. The alternative of using charcoal both for heating a $CO_2$-supply gives, however , lower costs than the combination of fuel oil and manufactured $CO_2$. The quotations, however, depend on the price trend of oil products, a development which probably favours the charcoal. 3 drawings, 1 table.

2653 **(GA-A—17109) Tubing for augmented heat transfer.** Yampolsky, J.S.; Pavlics, P. (GA Technologies, Inc., San Diego, CA (USA)). 1 Aug 1983. Contract AC22-79ET15210. 111p. NTIS, PC A06/MF A01. Order Number DE84002417.

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The objectives of the program reported were: to determine the heat transfer and friction characteristics on the outside of spiral fluted tubing in single phase flow of water, and to assess the relative cost of a heat exchanger constructed with spiral fluted tubing with one using conventional smooth tubing. An application is examined where an isolation water/water heat exchanger was used to transfer the heat from a gaseous diffusion plant to an external system for energy recovery. (LEW)

2654 **(ORNL/TM—8819) Corrosion of fluidized-bed boiler materials in synthetic flue gas.** Federer, J.I. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 37p. NTIS, PC A03/MF A01. Order Number DE84002998.

Candidate materials for components of a fluidized-bed waste heat recovery system (FBWHRS) include plain carbon steel, types 405 and 316 stainless steel, and alloy 800. These materials were exposed to synthetic flue gas at anticipated FBWHRS temperatures and higher for 3000 h to determine corrosion rates. The synthetic flue gas was a combustion atmosphere to which $Cl_2$ and HCl were added. The projected annual corrosion rate for plain carbon steel is about 0.08 mm/year (0.003 in./year) at 250 to 290°C, but it would exceed 0.5 mm/year (0.02 in./year) at 560°C. The projected annual corrosion rates of the other materials were less than 0.25 mm/year (0.01 in./year) at the maximum test temperatures of 560, 660, and 665°C for type 405, type 316, and alloy 800, respectively. These results indicate that corrosion of candidate FBWHRS materials will not be significant at anticipated operating temperatures for various components unless other factors, not included in this study, cause accelerated corrosion.

2655 **(VTT-TIED—209) Energy saving in the production processes of the concrete industry.** Alaealmi, M.; Kukko, M. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 67p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

Energy consumption and possibilities of saving energy in the production process of ready-mixed concrete plants and precast concrete factories manufacturing wall elements were studied in detail. Moreover, special features of beam, column and pile production and concrete product manufacturing were discussed from the energy saving points of view. The best possible energy saving is achieved by the use of right storing and heating techniques of aggregate and by the selection of a right heat treatment programme

and heat treatment method. As a result of the research a list of the possible means of saving energy, together with energy saving ideas, are introduced.

2656 **(VTT-TUTK—137) Energy research in the mechanical forest industry 1980-1982. Summary.** Usenius, A. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Dec 1982. 172p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The energy research project of the mechanical forest industry studied the energy consumption in 1979 and the possibilities to save energy in the sawmill, plywood, particleboard, fibreboard, joinery, wooden houses, gluelam and impregnation industries. The energy consumption per product unit is on the minimum level in sawmilling, 1.38 GJ/m³, and on the maximum level in fibreboard manufacturing, 9.98 GJ/t. In plywood production, 6.95 GJ/m³, the energy consumption is about double compared with the consumption in particleboard production, 3.40 GJ/m³. The main part of the energy is heat. In the drying process about 70-85% of the total energy is used in individual processes. Over a half, 53.9%, of the total energy consumption, 23 169 TJ, is used in sawmill industry. The proportion of plywood industry is 19.2%, of particleboard industry 12.2% and of fibreboard industry 7.2%. The proportion of the processing industry is 7.5%; the main part is used in joinery industry. The fuel consumption in transportation of wooden raw materials was 2 260 TJ and in transportation of products 4 800 TJ. In fibreboard industry it is possible to save energy by leading the waste steam from defibratory into chip silos for preheating of the chips. In veneer and chip drying it is possible to save energy by using higher moisture content of the drying air and by utilizing the drying capacity as well as possible. In kiln drying of timber the changing of drying circumstances can in some cases save 50-150 FIM per 1 cbm of dried timber.

2657 **(VTT-TUTK—156) Energy research in the mechanical forest industry 1980-1982. Optimization of veneer drying.** Soeyrilae, P.; Tuominen, M.; Salin, J.G. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Jan 1983. 125p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The aim of this study was to find out the optimum veneer drying conditions in plywood and veneer mills concerning the energy consumption and the quality of veneer. Preliminary tests were made in the laboratory to investigate how the qualities of dried veneers and plywood made of these veneers depend on the drying conditions. The mathematical quality models were calculated from the test material. A drying simulation model was prepared. The effects of changes in drying conditions on the energy consumption and the drying result can be calculated by the model. The results show that veneer drying can be theoretically simulated with satisfactory accuracy. In this way the drying result and the energy consumption in different drying conditions can be predicted. Energy consumption is highly dependent on drying conditions. The variation of consumption in the mill tests was very large. Thus there is every probability that energy savings can be realized in several factories.

2658 **(VTT-TUTK—181) Flue gas neutralization by adding gaseous ammonia.** Maekipaeae, M.; Hakkarainen, T.; Tunturi, P.J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 54p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The injection of gaseous ammonia into the flue gases of a boiler makes it practicable to combine the free sulphuric acid of flue gases and thus suppress corrosion and emissions of acid smuts. The applicability of the method was investigated. Controlled amounts of gaseous ammonia were injected into a flue connected to 150 kW oil-fired furnace at temperatures of 160-340 deg C. The dew point measured by LAND-type dew point meter, originally 140 deg C, was fully eliminated by an ammonia feed lower than 0.1 wt % of oil. Results of the tests and of the literature and thermochemical study suggest that the method is applicable only within a restricted temperature range. The need of injected ammonia must be closely controlled to avoid undesirable reactions leading to carbon-rich acidic or hydroscopic deposits on heat exchanger and equipment surfaces. Great economical benefits are available by suppressing the dew point and lowering the exit temperature of flue gases. Thus, further industrial tests are recommended.

## 3206 Municipalities And Community Systems

*REFER ALSO TO CITATION(S) 2184, 2568, 2640*

2659 **(ANL/CNSV-TM—120-Vol.2) Thermal systems for conversion of municipal solid waste. Volume 2. Mass burning of solid waste in large-scale combustors: a technology status report.** Turner, W.D. (Texas A and M Univ., College Station (USA). Dept. of Mechanical Engineering). Dec 1982. Contract W-31-109-ENG-38. 211p. NTIS, PC A10/MF A01. Order Number DE84002305.

Waterwalled incineration technology is discussed. Operational performance and status update are presented for eleven North American mass-burning waterwall incinerators. The future of mass-burning in the United States and research and development needs are explored. (MHR)

2660 **(BNL—33700-Summ.) Proceedings of the forum on district heating for Long Island.** Karkheck, J.; Powell, J. (eds.). (Brookhaven National Lab., Upton, NY (USA)). 19 Oct 1981. Contract AC02-76CH00016. 41p. (CONF-8110303—Summ.). NTIS, PC A03/MF A01. Order Number DE84001674.

From Forum on district heating for Long Island; Upton, NY, USA (19 Oct 1981).

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Highlights are given of the following talks: district heating concepts, district heating practice in Denmark, retrofit of power plants for district heating applications, land use and energy use on Long Island: present and future, NYSERDA District Heating Program, district heating and the NYSEO, major provisions of New York State cogeneration legislation, and HUD and district heating. Two case studies of potential district heating systems on Long Island are presented. (MHR)

2661 **(DOE/CS/20230—1) Resource Recovery Co-Disposal Demonstration Project, Middlesex County, New Jersey: feasibility study and recommendation for implementation. Final report.** (Middlesex County Dept. of Solid Waste Management, New Brunswick, NJ (USA)). Nov 1983. Contract FG01-79CS20230. 181p. NTIS, PC A09/MF A01. Order Number DE84002615.

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During the years represented by the Middlesex project, public environmental expectations have risen and regulatory structures have become more complex but at the same time the driving force of need for waste disposal capacity has intensified. The project is dealt with in two broad stages: evaluation of co-disposal proposal and development of a private business waste-to-energy project proposal.

2662 **(NP—3770427) Conversion of sewage sludge by anaerobic elimination of the heterofunction.** Maier, K.H. (Tuebingen Univ. (Germany, F.R.). Fakultaet fuer Chemie und Pharmazie). 29 Jan 1981. 114p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83770427.

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Formation of crude oil from biomass was initiated eliminating heterofunctions. Anaerobic elimination was performed under argon as protective gas at 180-210°C and atmospheric pressure. Phosphoric acid was used as catalyst. As model substance for anaerobic elimination of heterofunctions from sewage sludge albumin was used. The temperature range was from 210 until 320°C. Oil yields were maximum 24% of the albumin neutral $Al_2O_3$ proving as a good catalyst. Mixed catalysts increased yields up to 30%. Experiments with dried excess sludge without catalyst delivered highest yields at a temperature of 320°C and a reaction time of 3h resulting solid, liquid and gaseous products. The heats of combustion of solid products ranged between 16000 and 29 000 kJ/kg, and the ones of the liquid products at about 34 000 kJ/kg, but the high $N_2$

content of 5-7% disturbed. Experiments with catalyst were successful when mixed catalysts as $CuO/Al_2O_3$ were used. For instance the $N_2$ content of oil could be decreased to 2,25%. Heats of combustion of liquid products which have been catalysed with $CuO/Al_2O_3$ laid above the non catalysed by 4000-5000 kJ/kg by average and with 39700 kJ/kg reached a value which is quite comparable to crude oil. Because of these results anaerobic elimination seems to be a possible sewage sludge conversion method for the future.

2663 **(STUDSVIK—83-3) Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study.** Dahlgren, T.; Schmeling, P. (Studsvik Energiteknik AB, Nykoeping (Sweden)). Mar 1983. 60p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01 . Order Number DE83751421.

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A preliminary evaluation of the potential of competitiveness of heat pumps using waste heat and delivering heat to district heating is presented. The municipality of Nykoeping is used as a model and two proposals of systems have been calculated. Adsorption heat pumps have been compared with compressor driven heat pumps and with coal or oil fired hot water plants. If the coal price of to-day is used then the alternatives of heat pumps can be competitive with oil fired plants. The price of solid fuel will be decisive of the future cost.

2664 **(VTT-TUTK—179) Heat storage in district heating systems.** Kaerkkaeinen, S.; Ranne, A.; Sipilae, K. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). May 1983. 98p. (In Finnish). Valtion Teknillinen Tutkimuskeskus, Espoo, Finland.

The study concerns the economy of the centralized heat storing in district heating systems. The types of storages were steel vessels and underground rock caverns in large district heating systems and steel vessels in smaller systems. The large district heating systems with combined heat and power plants were studied on the basis of the district heating systems of the cities of Espoo and Tampere. The results indicate that the most profitable types of storages are steel vessels in the size class of 1 GWh , which are mainly used for daily and weekly regulation. The pay-back times are about 5 years when the real interest is 7% and the fuel prices are assumed to increase with 2%/year. The utilization of heat storage in the connection of boilers with domestic fuel was also profitable especially in cases where the rated output of the plant was high compared with the peak load of heat demand (at least 0.25-0.5 -fold depending on the case). The benefits of the storage are in these cases mainly based on replacing oil with cheaper domestic fuel, on the increasing annual efficienty of the boiler, and on the decreasing fixed operating costs.

### 3209 Education And Public Relations

*REFER ALSO TO CITATION(S) 2604*

2665 **(CONF-8210203—1) Professionalism in commercial infrared sensing: an update.** Courville, G.A. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE84001956.

From International conference on thermal infrared sensing diagnostics; Detroit, MI, USA (25 Oct 1982).

The value of Thermosense conferences is described. The following are included: comprehensive IR training programs, professional societies with commercial infrared activities, infrared standards, and a literature list for commercial infrared thermography. (MHR)

2666 **(DOE/CS/20173—T1) Municipal Energy Conservation Project. Final report.** (National League of Cities, Washington, DC (USA)). [nd]. Contract FG01-79CS20173. 3p. NTIS, PC A02/MF A01. Order Number DE84002127.

NLC's Municipal Energy Conservation Project was designed to provide technical assistance to cities in the research, development and demonstration of activities related to energy conservation in buildings, community systems, urban waste and consumer products. Working primarily through NLC's Conference of Local Energy Officials (CLEO), the project initiated a multi-faceted program of intergovernmental consultation, information dissemination, training, needs assessment, and state league capacity-building with the Division of Buildings and Community Systems of DOE. Specific tasks and information projects are listed.

## 33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

### 3301 Internal Combustion Engines

2667 **(N—8326763) Advanced Gas Turbine (AGT) powertrain system development for automotive applications.** (Garrett Turbine Engine Co., Phoenix, AZ (USA)). Dec 1982. 76p. (NASA-CR—168104). NTIS, PC A05/MF A01.

Topics covered include the AGT 101 engine test compressor design modification cold air turbine testing Mod 1 alloy turbine rotor fabrication combustion aspects regenerator development and thermal screening tests for ceramic materials. The foil gas bearings, rotor dynamics, and AGT controls and accessories are also considered.

2668 **(N—8327923) Cummins advanced turbocompound diesel engine evaluation.** Hoehne, J.L.; Werner, J.R. (Cummins Engine Co., Inc., Columbus, IN (USA)). Dec 1982. 46p. (NASA-CR—168042). NTIS, PC A03/MF A01.

An advanced turbocompound diesel engine program was initiated to improve the tank mileage of the turbocompound engine by 5% over the vehicle test engines. Engine improvements could be realized by increasing the available energy of the exhaust gas at the turbine inlet, incorporating gas turbine techniques into improving the turbomachinery efficiencies, and through refined engine system optimization. The individual and cumulative performance gains achieved with the advanced turbocompound engine improvements are presented.

2669 **(NP—3770411) Methanol-dual fuel operation of diesel engines with direct injection.** Havenith, C. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 11 May 1981. 165p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83770411.

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The objective of the investigations described here was to replace the greatest possible quantity of gas oil by methanol in diesel engines while maintaining a good efficiency degree of the engine. Exhaust gas quality improvement was a further aim. Experiments were made with suction-pipe administering of methanol, and direct injection of methanol together with a gas-oil ignition jet. Apart from clarifying which one of the diesel-fuel method was best suited for the utilization of high alcohol quantities the author shows the influence of important engine- and operational parameters on the so far hardly considered direct injection of methanol.

### 3302 External Combustion Engines

2670 **(CONF-830812—59) Stirling engines with controlled evaporation of a two-phase two-component working fluid.** West, C.D. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE83017284.

From 18. intersociety energy conversion engineering conference; Orlando, FL, USA (21 Aug 1983).

The specific power of a Stirling engine can be greatly increased by evaporating liquid in the hot expansion-space region. Theory and experiment have indicated that a twofold to threefold increase is possible. This paper shows that by controlling: (1) the rate at which the liquid is evaporated into the expansion cylinder; and (2) the phase of the cycle at which the evaporation takes place, still larger increases may be achieved under quite reasonable operating conditions. Successful application of this principle would make it practicable to operate simple low-pressure engines with

moderate hot-end temperatures and perhaps even with the very low temperatures associated with simple nontracking solar collectors and with certain reject heat streams.

2671 **(DOE/NASA/0254—1) Stirling engine application study.** Teagan, W.P.; Cunningham, D.R. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Mar 1983. Contract AI01-77CS51040. 252p. (NASA-CR—168087). NTIS, PC A12/MF A01. Order Number DE84002197.

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The potential for Stirling engine applications in the 0.5 to 5000 hp output range is assessed. The following are included: a market survey of potential engine applications, classification of applications, conventional engine markets and performance characteristics, status of Sterling engine systems, selection of application classes for Stirling engines, and the possible effects of technology, economic conditions, and regulatory changes. (MHR)

2672 **(N—8325036) Testing and performance characteristics of a 1-kW free piston Stirling engine.** Schreiber, J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Apr 1983. 48p. (NASA-TM—82999; E—1435). NTIS, PC A03/MF A01.

A 1 kW single cylinder free piston Stirling engine, configured as a research engine, was tested with helium working gas. The engine features a posted displacer and dashpot load. The test results show the engine power output and efficiency to be lower than those observed during acceptance tests by the manufacturer. Engine tests results are presented for operation at the two heater head temperatures and with two regenerator porosities, along with flow test results for the heat exchangers.

2673 **(N—8325043) A study of dynamic energy equations for Stirling cycle analysis. Final Report.** Larson, V.H. (Cleveland State Univ., OH (USA)). Apr 1983. 44p. (NASA-CR—168152). NTIS, PC A03/MF A01.

An analytical and computer study of the dynamic energy equations that describe the physical phenomena that occurs in a Stirling cycle engine is undertaken. The basic problem is set up in terms of a set of hyperbolic partial differential equations. The characteristic lines are determined. The equations are then transformed to ordinary differential equations that are valid along characteristic lines. Computer programs to solve the differential equations and to plot pertinent factors are described.

## 3305 Flywheel Propulsion

2674 **(UCRL—15562) Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report.** (Lawrence Livermore National Lab., CA (USA)). Aug 1983. Contract W-7405-ENG-48. 375p. NTIS, PC A16/MF A01. Order Number DE84002340.

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The development of a second generation flywheel automobile is described. The following topics are covered: specifications, alternate prime movers, study of driveline friction, flywheel safety studies, preliminary investigation of existing automatic transmission for use with continuously variable elements, continuously-variable-transmission (CVT) design incorporating the Van Doorne transmatic and the Chevrolet Citation three-speed automatic transmission design based on the Van Doorne transmatic and the Chevrolet Corvair power-glide planetary unit, a simplified two-range V-belt CVT, V-belt CVT with inverse power-split, slipping clutch continuously variable transmission, hydrostatic power-split studies flywheel automatic propulsion digital simulation program, real-time simulation, control strategy and component sizing studies, and four-square dynamometer and CVT testing. (MHR)

## 3306 Vehicle Design Factors

*REFER ALSO TO CITATION(S) 2631, 2802*

## 3307 Emission Control

2675 **(N—8326765) Derivation of I/M benefits for pre-1981 light duty vehicles for low altitude, non-California areas.** Rutherford, J. (Environmental Protection Agency, Ann Arbor, MI (USA)). Jun 1982. 69p. (PB—83-145102). NTIS, PC A04/MF A01.

The derivation of the Inspection/Maintenance (I/M) emission reduction benefits for pre-1981 model year vehicles (non-California low altitude) which were prepared for use in an emission factor model, MOBILE2, is presented. The MOBILE2 is a computer program which estimates fleet average emissions of the three regulated pollutants (hydrocarbons, carbon monoxide, and nitrous oxides) at various points in time under varying ambient and driving conditions. The effects of I/M are applied in MOBILE2 as percent reductions, or credits, to average emissions for various segments of the fleet.

## 3308 Alternative Fuels

*REFER ALSO TO CITATION(S) 2663*

# 36 MATERIALS

*REFER ALSO TO CITATION(S) 1755*

2676 **(EUR—7999) Finite element part of the LAMCAL program. Elastic-plastic fracture mechanics applications.** Lamain, L.G.; Blanckenburg, J.F.G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1982. 61p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703819.

The elastic-plastic FEM code described in this report is the third part of the Lamcal program of which the two other parts for mesh generating and plotting were presented previously. Also this part uses the dynamic core storage. All variables and problem defining data are stored in one common array-SPACE. If all three parts are used together, the same common-SPACE is reused in each part. The lay-out of the complete program is given. J-integral evaluation and plotting can be done immediately in the FE run or afterwards in a post processing run. Post processing is done within the FEM part with a reduced core space. Originally developed as a general code, the use of the present version is mainly focussed on research in the field of the fracture mechanics. Several J-integral routines are available as well as crack growth modelling by node release or stiffness reduction, energy calculations, crack tip elements, etc. In this report the theory is discussed and some sample problems are given. The theory is presented in two parts, the general FEM and the more specific EPFM theory. For the sample problems, a choice has been made to show the accuracy of the program under more or less severe loading conditions.

2677 **Preparation of ceramic particulates for transmission electron microscopy.** Lauf, R.J.; Keating, H. (Oak Ridge National Lab., TN). pp 196-197 of 38th Annual Proceedings of the Electron Microscopy Society of America. Bailey, G.W. (ed.). San Francisco, CA; Electron Microscopy Society of America (1980). Contract W-7405-ENG-26.

The preparation of fragmented or particulate ceramic materials for transmission electron microscopy (TEM) examination has traditionally been difficult, particularly if a durable, permanent specimen is desired. A technique has been developed that is useful for a variety of materials, permits the selection of specimen orientation, is compatible with ion milling requirements, and produces a durable specimen that can be reexamined later if necessary. A more recent application of this technique is in the study of fly ash from coal-fired power plants.

## 3601 Metals And Alloys

*REFER ALSO TO CITATION(S) 1933, 1934, 2069, 2199, 2215, 2230, 2231, 2237, 2250, 2251, 2272, 2279, 2279, 2283, 2283, 2290, 2291, 2333, 2796, 2963, 3088, 3092, 4165, 4166, 4172, 4173, 4174, 4175*

**2678 (CEA-N—2331) Low temperature irradiations of iridium and of the compound $Nb_3Ge$.** Gely, M.H. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Mar 1983. 78p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83704307.

The defects created during low temperature irradiations in iridium (measurement of the electrical resistivity) and in the supraconductor $Nb_3Ge$ (measurement of its critical temperature) are studied. During a reactor irradiation of iridium, the elastic collisions of the fast neutrons with the atoms create point defects as in most metals. But iridium interacts also strongly with the thermal neutrons via inelastic collisions: nuclear reactions occur. They lead to a modification of the defect distribution which takes even place once the irradiation is stopped. The irradiation of iridium with electrons (elastic collisions) shows that: the threshold displacement energy of Ir is Tsub(d) = (46 +- 2) eV and that no recombination of the defects occurs below 35 K. The reactor neutron irradiation is more complex. The interpretation of the results is based on the analysis of: i) the modification of the distribution of the defects due to the recoil of the radioactive nucleus when they desintegrate; ii) the formation of impurities of platinum by transmutation processes. The 20 K irradiation of $Nb_3Ge$ by fast neutrons and by $^{235}U$ fission fragments leads to a decrease of its critical temperature, even for very low fluences.

**2679 (CEA-R—5204) Low temperature irradiation effects on iron-boron based amorphous metallic alloys.** Audouard, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1983. 174p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83704308.

Three iron-boron amorphous alloys and the crystalline $Fe_3B$ alloy have been irradiated at liquid hydrogen temperature. 2,4 MeV electron irradiation induces the creation of point defects in the amorphous alloys as well as in the crystalline $Fe_3B$ alloy. These point defects can be assimilated to iron "Frenkel pairs". They have been characterized by determining their intrinsic electrical resistivity and their formation volume. The displacement threshold energy of iron atoms has also been determined. $^{10}B$ fission fragments induce, in these amorphous alloys, displacement cascades which lead to stable vacancy rich zones. This irradiation also leads to a structural disorder in relation with the presence of defects. $^{235}U$ fission fragments irradiation modifies drastically the structure of the amorphous alloys. The results have been interpreted on the basis of the coexistence of two opposite processes which induce local disorder and crystallisation respectively.

**2680 (DOE/ER/02313—13) Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983.** Olson, D.L.; Matlock, D.K. (Colorado School of Mines, Golden (USA)). 1983. Contract AC02-76ER02313. 83p. (COO—2313-13). NTIS, PC A05/MF A01. Order Number DE84003011.

Portions are illegible in microfiche products.

This research program consists of two parts: an evaluation of the corrosion behavior of ferrous alloys in liquid lithium, and a study of microstructure development and properties of dissimilar metal weldments. A ten year overview of the research accomplishments made is presented. During this past year, two programs on the effects of liquid lithium on fatigue crack growth were completed. Results on both 2 1/4 Cr-1Mo steel and Type 304 stainless steel clarified the importance of initial microstructure on the degree of fatigue crack growth rate enhancement in liquid lithium. Experimental results on Fe-Mn-Ni-Cr, Fe-Mn-Al, Fe-Mn-Ni-Cu-C welds are included and a thermodynamic analysis for predicting microstructures formed during welding is reported.

**2681 (DOE/ER/10570—T2) Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983.** Laird, C. (Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering). Aug 1983. Contract AC02-80ER10570. 12p. NTIS, PC A02/MF A01. Order Number DE83018126.

The proposal called for the parallel study of various kinds of damage produced in cyclic creep: (1) change in dislocation density and arrangement, to be studied in copper; (2) development of fracture mechanisms under cyclic creep in pure copper; and (3) damage phenomena perhaps involving precipitates in Cr-Mo-V rotor steel. Progress in studying these types of damage has been encouraging. In copper tested at low temperatures, strain bursts were recognized for the first time in polycrystals of a pure metal in both cyclic and static creep and in other forms of tests. Since then we have defined cyclic stress-strain response in cyclic creep, and carried out a study of single crystals in order to study better the dislocation structures associated with bursts. Strain bursts have been associated with abrupt increases in secondary dislocation activity. For the study of rotor steel, a Westinghouse steel was chosen for detailed study. The interesting indication of damage shown by the ratio of diametral strain to longitudinal strain, discovered early in the investigation, has been found not to apply at low strains. These results have reconciled those reported last year and which gave us problems of interpretation. In the study of fracture mechanisms in cyclic creep, we have found the Coffin-Manson law to apply and a two stage form of this law is associated with two different fracture regimes.

**2682 (DOE/ER/10956—6) Observation of the effect of solute segregation on grain boundary structure.** Sickafus, K.; Sass, S.L. (Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering). Nov 1983. Contract AC02-81ER10956. 5p. NTIS, PC A02/MF A01. Order Number DE84002964.

The segregation of Au to a small angle [001] twist boundary in an Fe-rich Fe-Au alloy causes a major change in the dislocation structure of the grain boundary from that present in pure Fe. The change in dislocation structure with increasing amount of solute is evidence for the occurrence of a two-dimensional phase transformation in the grain boundary.

**2683 (DOE/ER/45025—2) Artifically layered superconductors. Annual progress report.** Falco, C.M. (Arizona Univ., Tucson (USA)). Oct 1983. Contract AC02-83ER45025. 11p. NTIS, PC A02/MF A01. Order Number DE84002768.

We describe research accomplished during the first year of this contract. Several metallic superlattice systems have been prepared by sputtering techniques, structurally characterized by x-ray diffraction (both Bragg and Laue), and measurements made of their electrical transport properties. These metallic systems are found to grow with excellent structural coherence perpendicular to the layers, as evidenced by a large number of superlattice lines in the x-ray diffraction spectra. Also described in this progress are additions made to our equipment and facilities during the previous year. Our sputtering system now has microprocessor control of the substrate rotation, as well as of the sputtering rate. With these microprocessors, we are able to control the thickness of each layer of the superlattices to +-0.1%.

**2684 (DOE/ET/37249—1) Effects of alloy composition and processing on the microstructure of D-9 type stainless steel. Final report.** Hwang, M.; Laughlin, D.E.; Williams, J.C. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Metallurgy and Materials Science). Oct 1983. Contract AC02-80ET37249. 22p. NTIS, PC A02/MF A01. Order Number DE84003022.

The effects of composition modifications of Type 316 stainless steel on the constitution and microstructural stability during extended exposure to elevated temperature has been studied. Conventional TEM, (CTEM), Analytical TEM (STEM) and ultra-high resolution TEM have been used. It has been found that several relatively coarse, heterogeneously distributed constituents including Laves and G phases, TiN and $M_{23}C_6$ can form in addition to a fine, uniform distribution of MC. In the present case, the MC is TiC. The detailed nature of the latter constituent and its relationship to

the fcc γ matrix have been examined in detail. The results of CTEM are conflicting in that the electron diffraction evidence suggests that the particles should be semicoherent or noncoherent, whereas the images of the MC:γ interfaces show no structure in the form of ledges or misfit dislocations. Ultra-high resolution TEM showed that the lattice planes were continuous through the matrix and the TiC particles. These results suggest that the TiC is coherent despite the large mismatch between the lattices. This finding has significant bearing on the role of the TiC:γ interfaces as He sinks in fast neutron environments. 12 figures.

2685 **(EUR—7836) Optimization technique applied to interpretation of experimental data and research of constitutive laws.** Grossette, J.C. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1982. 129p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703816.

The feasibility of identification technique applied to one dimensional numerical analysis of the split-Hopkinson pressure bar experiment is proven. A general 1-D elastic-plastic-viscoplastic computer program was written down so as to give an adequate solution for elastic-plastic-viscoplastic response of a pressure bar subjected to a general Heaviside step loading function in time which is applied over one end of the bar. Special emphasis is placed on the response of the specimen during the first microseconds where no equilibrium conditions can be stated. During this transient phase discontinuity conditions related to wave propagation are encountered and must be carefully taken into account. Having derived an adequate numerical model, then Pontryagin identification technique has been applied in such a way that the unknowns are physical parameters. The solutions depend mainly on the selection of a class of proper eigen objective functionals (cost functions) which may be combined so as to obtain a convenient numerical objective function. A number of significant questions arising in the choice of parameter adjustment algorithms are discussed. In particular, this technique leads to a two point boundary value problem which has been solved using an iterative gradient like technique usually referred to as a double operator gradient method. This method combines the classical Fletcher-Powell technique and a partial quadratic technique with an automatic parameter step size selection. This method is much more efficient than usual ones. Numerical experimentation with simulated data was performed to test the accuracy and stability of the identification algorithm and to determine the most adequate type and quantity of data for estimation purposes.

2686 **(EUR—7923) 1981 Annual status report. High-temperature materials.** (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). 1981. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703828.

The high temperature materials programme is executed at the JRC, Petten Establishment and has for the 1980/83 programme period the objective to promote within the European Community the development of high temperature materials required for future energy technologies. A range of engineering studies is being carried out. A data bank storing factual data on alloys for high temperature applications is being developed and has reached the operational phase.

2687 **(EUR—8642-DE) Investigation of hydrogen embrittlement of steels for hydrogen flasks and pressure vessels.** Buechsenschuetz, R.; Dieser, K. (Hoechst A.G., Frankfurt am Main (Germany, F.R.). Werkstofftechnik). 1982. 89p. (In German). European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037.

Investigations were made on the hydrogen embrittlement of chrome-molybdenum alloyed pressure vessel steels by using hollow specimens in tensile tests with constant strain rates. For comparison, tests were carried out with nitrogen, too. At first the influence of strain rate was examined in the range between $3{,}5.10^{-6}s^{-1}$ and $8{,}3.10^{-4}s^{-1}$. After steel 34 CrMo 4-D turned out to be too inhomogeneous for giving significant results, the testing was repeated with steel 34 CrMo 4-AT which proved to be homogeneous. French steels were also tested.

2688 **(HEDL-SA—2909-FP) Use of the disk bend test to assess irradiation performance of structural alloys.** Hamilton, M.L.; Huang, F.H. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76FF02170. 15p. (CONF-8309170—1). NTIS, PC A02/MF A01. Order Number DE84001484.

From Symposium on the use of nonstandard subsized specimens for irradiated testing; Albuquerque, NM, USA (23 Sep 1983).

The disk bend test has been a valuable technique for rapid evaluation of the ductility of a large number of alloys under consideration for use as structural materials in both the breeder and fusion reactor programs. The test employs the 3 mm diameter, 0.3 mm thick microscopy and density disk specimen, conserving valuable experimental volume in the limited reactor space available. The test involves bending the disk symmetrically about the center, producing a simple, axisymmetric stress state. Experimental results are in agreement with a theoretical analysis of the bend configuration. Both the advantages and the limitations of the technique are discussed. The test has shown that both commercial precipitation-strengthened alloys and the Path B alloys of the US Fusion Program exhibit unacceptably low ductilities following irradiation. This was demonstrated for a number of alloys, in a variety of thermomechanical conditions, including cold worked, cold worked and aged, and solution treated and aged.

2689 **(HEDL-SA—2912-FP) Correlation of yield stress changes in 316 stainless steel irradiated with high-energy and fission neutrons.** Heinisch, H.L.; Simons, R.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Aug 1983. Contract AC06-76FF02170. 6p. (CONF-830942—58). NTIS, PC A02/MF A01. Order Number DE84002115.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Data on change in yield strength of SA 316 stainless steel irradiated with 14-MeV, Be(d,n) and fission reactor neutrons do not correlate with respect to damage energy. The data suggest possible temperature or additional spectral effects. A simple defect production function, based on the production of lobes in computer simulated cascades, correlates the data much better than damage energy.

2690 **(HEDL-SA—2913) Miniature center-cracked-tension specimen for fatigue crack growth testing.** Ermi, A.M.; James, L.A. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76FF02170. 23p. (CONF-8309170—3). NTIS, PC A02/MF A01. Order Number DE84001470.

From Symposium on the use of nonstandard subsized specimens for irradiated testing; Albuquerque, NM, USA (23 Sep 1983).

A miniature specimen was developed to characterize the effects of neutron irradiation on the fatigue crack growth behavior of candidate fusion reactor first wall materials. The specimen was designed using the following guidelines: (1) it must be small enough to be compatible with existing irradiation facilities; (2) it must be capable of being economically tested in the relatively large numbers required in an alloy development program; and (3) it must be large enough to produce valid results. During the development effort, questions regarding thickness, buckling, excessive plasticity, accuracy of crack length measurements, length-to-width ratio and proximity of welds to the notch (for welded inserts) were systematically addressed.

2691 **(HEDL-SA—2982) Fracture-mechanics behavior of neutron-irradiated Alloy A-286.** Mills, W.J.; James, L.A. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1983. Contract AC06-76FF02170. 28p. (CONF-8310198—1). NTIS, PC A03/MF A01. Order Number DE84001467.

From IAEA specialists on mechanical properties of structural materials; Chester, UK (10 Oct 1983).

The effect of fast-neutron irradiation on the fatigue-crack propagation and fracture toughness behavior of Alloy A-286 was characterized using fracture mechanics techniques. The fracture toughness was found to decrease continuously with increasing irradiation damage at both 24°C and 427°C. In the unirradiated and low fluence conditions, specimens displayed appreciable plasticity prior to fracture, and equivalent K/sub Ic/ values were determined

from J/sub Ic/ fracture toughness results. At high irradiation exposure levels, specimens exhibited a brittle K/sub Ic/ fracture mode. The 427°C fracture toughness fell from 129 MPa$\sqrt{m}$ in the unirradiated condition to 35 MPa$\sqrt{m}$ at an exposure of 16.2 dpa (total fluence of $5.2 \times 10^{22}$ n/cm$^2$). Room temperature fracture toughness values were consistently 40 to 60% higher than the 427°C values. Electron fractography revealed that the reduction in fracture resistance was attributed to a fracture mechanism transition from ductile microvoid coalescence to channel fracture. Fatigue-crack propagation tests were conducted at 427°C on specimens irradiated at 2.4 dpa and 16.2 dpa. Crack growth rates at the lower exposure level were comparable to those in unirradiated material, while those at the higher exposure were slightly higher than in unirradiated material.

2692 (IAE—3575/11) **Dynamics of radiation-induced point defects in metals.** Dement'ev, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 44p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703987.

Kinetics of radiation-induced point defects in metals is studied. It was necessary to carry out rather a detailed analysis of the problem in veiw of a classical simplicity of the corresponding equation system and its sufficient importance for the defect theory. A phenomenon of substantially nonlinear, explosive stability has been revealed. The conditions under which the summary defect concentration in the relaxation processes proceed through two extremes. A detailed dicussion is made of the resonance phenomenon between the relaxation (synchronous- and singular relaxation) rates, and of specific features of two-stage relaxation at large pumpings. The calculation results may be used for clarification of the substance parameters and radiation physics of defects.

2693 (INIS-BR—79, pp 17-31) **Electronic structure of metallic alloys through Auger and photoemission spectroscopy.** Kleiman, G.G.; Rogers, J.D.; Sundaram, V.S. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica). Oct 1981. NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A review is presented of experimental results of electron spectroscopy studies for various series of transition metal alloys as well as a model for their interpretation which leads to the possibility for the first time to determine independently relative variations in the dipole barrier and Fermi energy contributions to the work function.

2694 (INIS-BR—79, pp 87) **Plasmons in the interphase between two metals.** Reyes, J. (Universidad Autonoma de Puebla (Mexico). Inst. de Ciencias); Uberoi, C. (Indian Inst. of Science, Bangalore). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2695 (INIS-BR—79, pp 103-106) **Metallic surface description in a localized representation.** Kirtman, B. (California Univ., Santa Barbara (USA). Dept. of Chemistry); Melo, C.P. de (Pernambuco Univ., Recife (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Binding orders for a three-dimensional system (cubium) are obtained. The study of convergence of these values with the progressive interiorization in the solid gives an indication of the perturbation magnitude introduced with the surface creation. Following Goddard's hint in which the nickel reactivity is denominated by the 4s orbitals, such a model is applied to this metal. The base transformation of atomic orbitals for the correspondent Wannier functions is obtained.

2696 (INIS-BR—79, pp 107-110) **Chemisorption of atomic hydrogen in nickel.** Mariz, A.M. (Rio Grande do Norte Univ., Natal (Brazil). Dept. de Fisica); Koiller, B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The problem of atomic chemisorption in metallic surface by the transfer matrix formalism, which permits the geometrical factor incorporation, relative both to the substrate crystal structure and adsorption site localization, is studied. The electron correlation in the adsorbed atom orbital (adatom) is treated in Hartree-Fock self-consistent approximation. The local density of states, the adsorption energy and the charge transfer between the adatom and the substrate for values of parameters relative to the hydrogen chemisorption in the paramagnetic nickel (100) surface are calculated. A comparison of the results with other theories and experimental data shows this scheme to be convenient for the problem in study.

2697 (INIS-BR—79, pp 111-115) **Modification of the iron mechanical- and corrosion features by ion implantation in surface.** Baumvol, I.J.R. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The physical mechanisms responsible by the tin ion implantation in the iron surface at moderated doses are studied. Several techniques are used such as alpha-particle Rutherford backscattering, conversion electron Moessbauer spectroscopy and scanning electron microscopy.

2698 (INIS-BR—79, pp 117-120) **Decomposition of water adsorbed in iron and nickel films.** Heras, J.M.; Albano, E.V.; Viscido, L. (INIFTA, La Plata (Argentina)). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The interaction of water with metallic surfaces, in particular, the water thermodesorption in iron and nickel films is studied.

2699 (INIS-BR—79, pp 121-124) **Oxidation effects on the electric resistance of In and Al in thin layers.** Moncada, G.; Araya, J.; Clark, N. (Costa Rica Univ. Escuela de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Measurements of electric resistance (R) as a function of the time in evaporated samples of thin layers of In and Al trivalent elements in both vacuum and atmospheric pressure are reported. Measurements in samples at ambient and cooled with nitrogen temperatures taken place. The changes observed in R is attributed partly to changes in the sample surface produced by the oxidation.

2700 (INIS-BR—79, pp 145-149) **Diffusion assisted by radiation as a surface protection method.** Baumvol, I.J.R. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The effect of the tin and calcium diffusion assisted by radiation in the performance of the pure iron surface is described and analysed.

2701 (INIS-BR—79, pp 167-170) **Analysis of the Al-Ag thin film system by Rutherford Backscattering Spectroscopy (RBS) and Auger Electron Spectroscopy (AES).** Oliver, A.; Garcia Santibanez, F. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Concentration profile studies of the Al-Ag system carried out by Rutherford Backscattering Spectroscopy and Auger Electron Spectroscopy for evaporated films at high vacuum are reported.

2702 (INIS-BR—79, pp 191) **Local field effects in the absorbed monoshell reflectance on substrates with spatial dispersion.** Barrera, R.G.; Fuchs, R. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica); Bagchi, A. (Xerox Corp., Webster, NY (USA)). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2703 (INIS-BR—79, pp 213) **Absorption of spin-dependent electrons in metals.** Helman, J.S. (Instituto Politecnico Nacional, Mexico City. Centro de Investigacion y de Estudios Avanzados). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2704 (INIS-BR—79, pp 229) **Curie temperature in Nickel thin films.** Araya, J.A.; Merlos, H. (Costa Rica Univ.). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2705 (INIS-mf—8260) **Investigation of lattice defects in zinc after proton and electron irradiation.** Seeboeck, R. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik). 22 Jul 1981. 128p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83704384.

The thesis describes experiments on defects in zinc which are produced by electron and proton beams. During annealing the free migration of vacancies in zinc is found. This fact is explained by the one-interstitial model which is therefore valid for zinc.

2706 (INIS-mf—8272) **Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°.** Reineking, A. (Goettingen Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 30 Apr 1982. 48p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704383.

Double-differential cross sections for the inelastic scattering of photons with the primary energy 661.66 keV and a scattering angle theta = 145° by copper, tin and lead were measured. Numerical methods were developed, which allow the calculation of the relativistic form factor for s- and p- electrons and of the relativistic momentum approximation for all the electrons of the atom.

2707 (INIS-mf—8274) **Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants.** Richter, J. (comp.). (Staatliche Materialpruefungsanstalt, Stuttgart (Germany, F.R.)). Nov 1981. 61p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704393.

The present paper deals with the solubility and diffusion of hydrogen in iron, the influence of lattice defects on the solubility and diffusion of hydrogen and the influence of hydrogen on the material and fracture behavior. In addition hydrogen-induced crack propagation in liquid phases as well as hydrogen embrittlement of welded joints are discussed.

2708 (JAERI-M—82-055) **Measurement of corrosion of mild steel in high temperature-pressure pure water under γ-irradiation.** Sakumoto, Akihisa; Gotoda, Masao. (Japan Atomic Energy Research Inst., Tokyo). Jun 1982. 55p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703758.

Application of electrochemical measurement on the corrosion behaviour of mild steel was examined in high temperature and pressure pure water under γ-irradiation. The large effect of γ-irradiation on the corrosion rate of mild steel was observed in the early period of immersion. X-Ray photoelectron spectroscopy (XPS) was used to determine the composition of oxide film. It was found that the unknown oxygen compound, OX, other than $O^{2-}$ and $OH^{-}$, and graphite-like substance on the surface were formed by γ-irradiation. It is presumed that the mechanism of corrosion under γ-irradiation is different from that without γ-rays.

2709 (KFTI—82-32) **Diffusion decay of binary precipitation in "transitional" asymptotic range.** Sleptsov, S.N.; Slezov, V.V.; Sagalovich, V.V. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1982. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704303.

Diffusion decay of binary precipitation in the "transitional" asymptotic range where the rate of precipitation growth is controlled by interface processes and mass transfer by means of volume diffusion is theoretically investigated. Expressions describing dynamics of the "locking" point, rate evolution of precipitation growth and transformation of the distribution function in the "transitional" range are obtained. The experimental results on the γ'-precipitation growth in the Ni-Al system are processed on the base of the developed theory and good agreement of the theory with experiment is obtained.

2710 (LA—9798-P, pp 403-407) **Studies of magnetic phase transitions with muons.** Dodds, S.A. (Rice Univ., Houston, TX). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The asymmetric decay of the muon can be used to probe solid-state phenomena. As an example, the use of muons to study the phase transition of a disordered magnetic system is discussed. The advantages of the proposed new facilities are shown to be substantial.

2711 (LA-UR—83-2982) **Superconducting ground state of a strongly interacting electron system: $UBe_{13}$.** Ott, H.R.; Rudigier, H.; Fisk, Z.; Smith, J.L. (Los Alamos National Lab., NM (USA); Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik). 1983. Contract W-7405-ENG-36. 8p. (CONF-8308132—1). NTIS, PC A02/MF A01. Order Number DE84001708.

From NATO/CAP institute on moment formation in solids; Vancouver Island, Canada (21 Aug 1983).

The following experimental properties of $UBe_{13}$ are discussed: magnetic susceptibility, magnetization, electrical resistivity, and specific heat. Results suggest that the superconducting state of $UBe_{13}$ may not be primarily due to conventional electron-phonon

coupling, but rather a result of interactions of magnetic origin, probably antiferromagnetic. (DLC)

2712 **(SAND—83-8024) Porosity decrease in laser welds of stainless steel using plasma control.** Estill, W.B.; Formisano, B.D. (Sandia National Labs., Livermore, CA (USA)). Nov 1983. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01. Order Number DE84002194.

High-energy laser welding incorporating plasma control has been studied and reported by numerous investigators. These investigators demonstrated significant increases in laser weld penetration by use of plasma control. This report shows, in addition to variations in weld penetration, drastic decrease in porosity and variation in weld bead shapes resulting from laser welds incorporating plasma control. In particular, deep laser welds (greater than 6 mm) have been produced in 304L stainless steel that show no root porosity and only very few, if any, detectable micropores.

2713 **(UCRL—87469) Welding of uranium and uranium alloys.** Mara, G.L.; Murphy, J.L. (Lawrence Livermore National Lab., CA (USA); Oak Ridge Y-12 Plant, TN (USA)). 26 Mar 1982. Contract W-7405-ENG-48. 47p. (CONF-8105139—15). NTIS, PC A03/MF A01. Order Number DE84002773.

From ASM metallurgical technology of uranium and uranium alloys seminar; Gatlinburg, TN, USA (26 May 1981).

The major reported work on joining uranium comes from the USA, Great Britain, France and the USSR. The driving force for producing this technology base stems from the uses of uranium as a nuclear fuel for energy production, compact structures requiring high density, projectiles, radiation shielding, and nuclear weapons. This review examines the state-of-the-art of this technology and presents current welding process and parameter information. The welding metallurgy of uranium and the influence of microstructure on mechanical properties is developed for a number of the more commonly used welding processes.

2714 **Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying.** Koch, C.C.; Cavin, O.B.; McKamey, C.G.; Scarbrough, J.O. (Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Applied Physics Letters;* **43**: No. 11, 1017-1019(1 Dec 1983). Contract W-7405-ENG-26.

"Amorphous" $Ni_{60}Nb_{40}$ has been prepared by mechanical alloying of elemental nickel and niobium powders in a laboratory ball mill in controlled environments. X-ray diffraction was used to follow the progress of the mechanical alloying which eventually produced "amorphous" diffraction patterns similar to those for liquid quenched amorphous $Ni_{60}Nb_{40}$. Crystallization behavior was measured by differential scanning calorimetry for the mechanically alloyed and liquid quenched material. The differences that were observed in this behavior, and in the products of crystallization, may be attributed to impurities (especially oxygen) introduced during mechanical alloying.

2715 **Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD$/sub x/. I. Preparation and neutron powder diffraction.** Rotella, F.J.; Flotow, H.E.; Gruen, D.M.; Jorgensen, J.D. (Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **79**: No. 9, 4522-4531(1 Nov 1983). Contract W-31-109-ENG-38.

The structures of the single-phase, well-crystallized family of hydrides $Zr_3V_3OD$/sub x/ for x = 0, 1.86, 2.85, and 4.93 have been refined by the Rietveld method from neutron powder diffraction data taken at 298 K. The alloy and the three deuterides studied all possess the eta-carbide structure (cubic Fd3m; origin at 43m). Deuterium is found to occupy four different tetrahedral interstices preferentially. Sites with the largest number of Zr near neighbors appear to fill first unless occupation is hindered by nearby oxygen or simultaneously occupied deuterium sites. The volume expansion per number of deuterium atoms is nearly linear, even though the lowest stable hydride concentration at 298 K is near $Zr_3V_3OD$/sub 1.5/ and markedly nonlinear distortions occur within the unit cell as different sites fill.

2716 **Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD$/sub x/. II. Application of a geometric model.** Westlake, D.G. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **79**: No. 9, 4532-4538(1 Nov 1983). Contract W-31-109-ENG-38.

A geometric model has been applied to the eta-carbides $Zr_3V_3OD$/sub x/, which belong to space group Fd3m. With criteria of minimum hole size and minimum distance between deuterium atoms and with the assumption that the larger interstices are preferred, it was possible to rationalize the experimentally observed preference, in decreasing order, for 32e sites, 192i sites, $96g_1$, and $96g_2$ sites. The respective numbers of coordinating metal atoms for these interstices are $Zr_3V$, $Zr_2V_2$, $Zr_1V$, and $ZrV_3$. The largest interstices, which are the octahedral 8a sites with $Zr_6$ coordination, remain empty for x = 1.86, 2.85, and 4.93 because of their proximity to the more numerous 32e sites. The failure of deuterium atoms to occupy any $96g_1$ ($Zr_3V$) sites at x = 1.86 may indicate the existence of a short-range repulsive interaction between oxygen and deuterium. The possibilities for achieving higher values of x are also explored.

2717 **(RFP-Trans—416) Electrolyzer for obtaining and refining metals.** Zarubitskii, O.G.; Budnik, V.G. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Nov 1983. Contract AC04-76DP03533. Translation of USSR Patent Application No. 420699, March 1974. 3p. NTIS, PC A02/MF A01. Order Number DE84002812.

An electrolyzer for obtaining and refining metals, e.g., lead and bismuth, consisting of a lined cell with a metallic cathode and liquid anode placed inside, is distinguished by the fact that, for the purpose of simplifying the electrolyzer design and making it possible to regulate the temperature gradient between the solid cathode and the liquid anode, the cathode is made hollow, is placed horizontally, and is fitted with a short pipe for feeding in a cooling agent.

2718 **Multilayer relaxation of interlayer registry and spacing at high-index metal surfaces.** Barnett, R.N.; Landman, U.; Cleveland, C.L. (School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332). *Physical Review Letters;* **51**: No. 15, 1359-1361(10 Oct 1983). Contract AS05-77ER05489.

Oscillatory multilayer relaxation of both interlayer spacing and registry at certain high-index metal surfaces is predicted via minimization of a simple model for the total energy of a semi-infinite crystal. Results for the (210) and (211) surfaces of bcc and fcc simple metals indicate that the relaxation parallel to the surface plane moves the surface layers toward more symmetrical configurations with respect to adjacent layers.

2719 **Laser annealing of Ni(001).** McConnell, R.P.; Jamison, K.D.; Dunning, F.B.; Walters, G.K. (Department of Physics and the Rice Quantum Institute, Rice University, Houston, Texas 77251). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* **1**: No. 4, 1852-1856(Oct 1983).

The use of laser annealing in the preparation of a clean, well-ordered Ni(001) surface has been investigated. The surface was cleaned by argon ion bombardment and subsequently irradiated with the fundamental output of a high power, Q-switched ruby laser. The laser treated surface was characterized by use of Auger electron spectroscopy and both conventional and spin-polarized LEED, and the data compared to that from a surface prepared by thermal annealing. Laser irradiation of a sputtered surface at energy densities of $\sim$0.8 J $cm^{-2}$ leads to complete removal of residual argon without segregation of carbon or other contaminants at the surface. However, irradiation at an elevated temperature $\sim$200 °C is required to obtain a well-ordered surface. At elevated temperatures, laser annealing provides a surface with cleanness and surface order comparable to that obtained by conventional thermal annealing.

2720 **Metastable phase separation in Au-Fe alloys.** Violet, C.E.; Borg, R.J. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review Letters;* **51**: No. 12, 1073-1076(19 Sep 1983). Contract W-7405-ENG-48.

$^{57}$Fe Moessbauer spectra at 4.2 K of Au-Fe alloys with Fe concentration between 10.5 and 33 at.% are well described by two superposed six-line spectra. Presumably, these derive from two different chemical environments which are identified with the <420>-platelet and solid-solution phases.

2721 **Renormalization of the H-point phonon anomaly in molybdenum.** Fu, C.; Ho, K.; Harmon, B.N.; Liu, S.H. (Ames Laboratory, U. S. Department of Energy, Ames, Iowa 50011 and Department of Physics, Iowa State University, Ames, Iowa 50011). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 2957-2961(15 Sep 1983). Contract W-7405-ENG-82.

The frequency of the H-point phonon of molybdenum obtained from precise frozen-phonon calculations differs from the experimental value by 9%. An analysis of this unusually large discrepancy shows that nonadiabatic effects are small, while effects caused by the many-body renormalization of electronic states near the Fermi energy are of the same order of magnitude as the discrepancy.

2722 **Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies.** Smith, R.J.; Ghosh, A. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3043-3048(15 Sep 1983).

We have carried out low-energy electron-diffraction and ultraviolet photoemission spectroscopy studies of the surface structures formed by annealing Sn overlayers deposited on Nb(110) substrates at room temperature. In addition to the usual ring patterns observed by electron diffraction, we observe a preferred azimuthal orientation with $Nb_3Sn$ [100] parallel to Nb [111] in the surface plane. The photoemission results show three regimes of Sn coverage extending from submonolayer Sn structures to the limit of thick islands of Sn, the latter being a prerequisite to forming the A15, $Nb_3Sn$ structure. The contribution of the Sn 4p states to the electronic structure is followed as a function of Sn coverage. The evolution of the photoemission spectra as a function of sample annealing shows the trend through the A15 structure to the relatively inert p(1 x 1) phase of Sn on Nb.

2723 **All-electron local-density theory of alkali-metal bonding on transition-metal surfaces: Cs on W(001).** Wimmer, E.; Freeman, A.J.; Hiskes, J.R.; Karo, A.M. (Materials Research Center and Physics Department, Northwestern University, Evanston, Illinois 60201). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3074-3091(15 Sep 1983).

A theoretical study of the nature and the mechanism of the bonding of an alkali metal (Cs) on a transition-metal surface [W(001)] in the high-coverage limit is presented in order to understand and explain the lowering of the work function and to elucidate the role of W surface states and surface resonance states in the adsorption process. The analysis is based on all-electron local-density—functional results obtained with our self-consistent full-potential linearized augmented-plane-wave method for thin films for (1) a five-layer slab of W, (2) an unsupported Cs monolayer, and (3) Cs in a c(2 x 2) structure on both sides of the five-layer W slab for three different Cs-W separations. We find that Cs forms a polarized-metallic rather than ionic overlayer: The Cs valence electrons originating from the atomic 6s states are polarized toward the W surface leading to an increase of electronic charge in the Cs/W interface region and a depletion of electronic charge on the vacuum side of the overlayer. In addition, the semicore Cs 5p electrons are markedly counterpolarized. The net result of these multiple surface dipoles is a lowering of the work function upon cesiation from 4.77 eV (clean five-layer W slab) to 2.77, 2.55, and 2.28 eV, corresponding to heights of the Cs atoms above the W surface of 2.60, 2.75, and 2.90 A, respectively. The Cs-induced changes in the charge density are essentially localized outside the surface W atoms. The W d surface states and surface resonance states which are so characteristic of the W(001) surface are found to persist on the cesiated W(001) surface.

2724 **Electronic structure of metal overlayers on rhodium.** Feibelman, P.J.; Hamann, D.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3092-3099(15 Sep 1983). Contract AC04-76DP00789.

We have evaluated work functions, surface core-level shifts, and surface band dispersions for clean, Ag-covered, and Pd-covered Rh(100) surfaces, and for clean and Ag-covered Rh(111). The calculations were performed self-consistently, using the surface-linearized augmented-plane-wave method. As expected from the Pauling electronegativities, Ag adsorption lowers the work function from the clean Rh value, by several tenths of an eV, while Pd has an almost negligible effect. The values calculated for the core-level shifts of various films are shown to correspond to expectations based on surface band narrowing and layerwise charge neutrality. Using the core-level shifts, we predict heat-of-adsorption differences (for Ag on Pd vs Ag on Rh, etc.) that are in quite good agreement with the empirical predictions of Miedema and Dorleijn. Finally, the chemical inactivity of the Ag-covered Rh surface is associated with the fact that, for that system, the outer-layer local density of states is essentially that of Ag, with a characteristically low value at the Fermi energy. On the other hand, the Pd-covered Rh surface should behave much like clean Rh with an extra electron per surface atom. The surface band dispersions for the Pd-covered and clean Rh surfaces are closely similar. This result contrasts sharply with the case of Pd-covered Nb, for which, because of the appreciable electronegativity difference, the Pd overlayer is effectively "noble."

2725 **Kinetics of radiation-induced segregation in Ni—12.7 at. % Si.** Averback, R.S.; Rehn, L.E.; Wagner, W.; Wiedersich, H.; Okamoto, P.R. (Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3100-3109(15 Sep 1983).

The kinetics of radiation-induced segregation in Ni—12.7 at. % Si alloys was investigated using in situ, simultaneous Rutherford-backscattering spectrometry. It was observed that a precipitate layer of $\gamma'$—$Ni_3Si$ grew at the specimen surface during 2.0-MeV He and 2.75-MeV Li irradiations. The thickness of the $\gamma'$ layer was measured as a function of dose, dose rate, and temperature. For all of the irradiation conditions the $\gamma'$ layer thickness grew proportionately to the square root of dose. The proportionality constant, or growth-rate constant, was dependent on temperature and dose rate. Below ~570 °C the growth-rate constant displayed Arrhenius behavior with an apparent activation enthalpy of 0.30 +- 0.04 eV, and it depended approximately on the -(1/4)th power of the dose rate. Above 590 °C the growth-rate constant also displayed Arrhenius behavior but with an apparent activation enthalpy of -0.75 +- 0.15 eV; moreover, it was independent of dose rate in this temperature regime. A simple model for radiation-induced segregation is described which relates the segregation results to high-temperature point-defect properties in alloys. It shows that the apparent activation enthalpy of the growth-rate constant at low temperatures is equal to (1/4) the enthalpy of vacancy migration, and that at high temperatures it is equal to -(1/2) the enthalpy of vacancy formation. The model also correctly predicts the observed dose-rate dependences of the growth-rate constant in the two temperature regimes.

2726 **Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass.** MacLaughlin, D.E.; Gupta, L.C.; Cooke, D.W.; Heffner, R.H.; Leon, M.; Schillaci, M.E. (University of California, Riverside, California 92521). *Physical Review Letters;* **51**: No. 10, 927-930(5 Sep 1983).

Muon spin relaxation measurements have been carried out below the "glass" temperature T/sub g/ in AgMn spin-glasses. The muon spin-lattice relaxation rate varies with field H as H/sup -0.46plus-or-minus0.05/ for 0.30< or =T/T/sub g/< or =0.66. This suggests that impurity-spin correlations decay with time as t/sup -nu/, $\nu \approx 0.54$ +- 0.05, in contrast to the more usual exponential

decay. The present data therefore agree quantitatively with the prediction $\nu_{\infty}(1/2)$ of mean-field dynamic theories.

2727 **Fusion welding process.** Jones, E.D.; Mcbride, M.A.; Thomas, K.C. (to Dept. of Energy). US Patent 4,390,777. 28 Jun 1983. Filed date 19 Mar 1981. vp.
PAT-APPL-245487.

A process for the fusion welding of nickel alloy steel members wherein a ferrite containing pellet is inserted into a cavity in one member and melted by a welding torch. The resulting weld nugget, a fusion of the nickel containing alloy from the members to be welded and the pellet, has a composition which is sufficiently low in nickel content such that ferrite phases occur within the weld nugget, resulting in improved weld properties. The steel alloys encompassed also include alloys containing carbon and manganese, considered nickel equivalents.

2728 **Electronic structure of scandium lithide.** Harrison, J.F. (Argonne National Lab., Argonne, IL). *Journal of Physical Chemistry;* **87**: No. 8, 1323-1326(14 Apr 1983).

The electronic structure of ScLi has been studied by MCSCF and CI techniques. The states that correlate with the $4s^23d$ configuration of Sc ($^1,^3\Sigma^+$, $^1,^3\Pi$, $^1,^3\Delta$) are weakly bound (<6 kcal/mol) and lie within a few kcal/mol of one another precluding a meaningful assignment (based on these calculations) of the ground state. Those states that correlate with the $^4F$ state of the $4s3d^2$ configuration ($^1,^3\Sigma^-$, $^1,^3\Pi$, $^1,^3\Delta$, $^1,^3$phi) are more strongly bound, $^3\Sigma^-$ having a calculated D/sub e/ of 34 kcal/mol realtive to the calculated $^4F$ asymptote. If we reference the calculated D/sub e/ for $^3\Sigma^-$ to the experimental $^4F$-$^2D$ separation of 33 kcal/mol, we see that, although this state correlates with the $^4F$, it is bound by 1 kcal/mol relative to the $^2D$ asymptote. The differences between ScLi and ScH and the similarities to $Sc_2$ are noted.

2729 **Surface energy of zinc.** Bilello, J.C.; Dew-Hughes, D.; Pucino, A.T. (Department of Materials Science and Engineering, State University of New York, Stony Brook, New York 11794). *Journal of Applied Physics;* **54**: No. 4, 1821-1826(Apr 1983).

The influence of temperature and associated dislocation microstructure on the energetics of basal plane cleavage in zinc crystals has been investigated using the method of Hull, Beardmore, and Valentine (HBV). A marked temperature dependence was observed in the zinc surface energy, over the range 77—298 °K, contrary to previous expectations. Plastic relaxation was associated with crack initiation at 77 °K, but not propagation; while at room temperature a plastic zone of 1200—1500 μm in depth was produced by crack extension. The surface energy could be estimated, independent of the usual Griffith analysis, by measuring the energy dissipation in a fully relaxed deformed zone associated with an explosively formed precursor crack. This method yielded surface energies of 0.066 to 0.079 J $m^{-2}$ which was in good agreement with previous work. It is demonstrated that the cleavage surface energy of zinc is well below the thermodynamic surface energy and that this discrepancy is not related to plastic deformation.

2730 **Dynamic recrystallization during the transient deformation of a vanadium microalloyed steel.** Sakai, T.; Akben, M.G.; Jonas, J.J. (Department of Metallurgical Engineering, McGill University, 3450 University Street, Montreal H3A 2A7). *Acta Metallurgica;* **31**: No. 4, 631-642(Apr 1983).

The nature of dynamic recrystallization stress strain curves was studied following an increase or decrease in strain rate after deformation into the steady state region. For this purpose, a vanadium microalloyed steel was hot compressed at constant true strain rates of 5.6 x $10^{-5}s^{-1}$ to 7.4 x $10^{-2}s^{-1}$ at a testing temperature of 1000 C. After an increase in strain rate, the flow curve displayed a single peak; the strain & in this case was distinctly smaller than that associated with the annealed structure. After a decrease in strain rate, by contrast, the flow curve displayed a multiple peak: under these conditions &' /SUB p/ was nearly equal to that for the annealed structure. The transients observed after a strain rate change were of the inverse type, thus differing sharply from those observed when dynamic recovery is rate controlling. The critical condition at which the shape of the stress-strain curve changed from the multiple to the single peak type was D /SUB x1/ , = D /SUB x2/ . (Here D /SUB s1/ and D /SUB s2/ are the stable dynamically recrystallized grain sizes before and after the change in strain rate, respectively.) This differs from the critical condition for the annealed structure, i.e. D /SUB o/ = 2D /SUB v/ where D /SUB o/ and D /SUB v/ are the initial and stable grain sizes. These results are interpreted in terms of a grain size based model for dynamic recrystallization.

2731 **The effect of preinjected gas atoms on depth dependent damage in self-ion irradiated nickel.** Bullen, D.B.; Billen, J.H.; Kulcinski, G.L. (Nuclear Engineering Dept., University of Wisconsin, Madison, WI 53706). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1743-1745(Apr 1983).

The effect of interstitial gas atoms on cavity formation in self-ion irradiated nickel specimens is studied utilizing a 700-kV accelerator to inject $H^+$ or $He^+$ ions into nickel foils. A tandem accelerator then irradiates the foils with 14-MeV nickel to produce displacement damage. Details of the irradiation facilities are presented. Sample preparation and analysis techniques are described. Preliminary results and plans for future experiments are described.

2732 **Theoretical studies of surface diffusion: Self-diffusion in the fcc(100) system.** McDowell, H.K.; Doll, J.D. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **78**: No. 6, 3219-3222(15 Mar 1983).

Surface self-diffusion constants for the fcc(100) Lennard—Jonesium system were calculated using classical molecular dynamics methods. Self-diffusion Arrhenius parameters calculated using pair potentials derived from bulk thermodynamic data were found to be in good agreement with reported Rh(100) experimental values.

2733 **Rapid solidification microstructures in austenitic Fe-Ni alloys.** Hayzelden, C.; Cantor, B.; Rayment, J.J. (School of Engineering and Applied Sciences, University of Sussex, Brighton, Sussex). *Acta Metallurgica;* **31**: No. 3, 379-388(Mar 1983). Contract AC03-76SF00098.

The microstructures of rapidly solidified austenitic Fe-Ni alloys have been investigated by a combination of scanning and transmission electron microscopy, X-ray diffraction and X-ray microanalysis. Temperature measurements during rapid solidification have been used to interpret the results. Rapid solidifiation is shown to be a non-Newtonian cooling process, with high liquid undercooling before the onset of solidification, followed by adiabatic recalescence while solidification takes place. Detailed composition measurements provide direct evidence that high liquid undercooling causes massive segregation-free solidification, but recalescence can produce a breakdown in the later stages of solidification to a cellular, segregated solidification structure.

2734 **Growth and interconnection of pressurized pores in nickel and relation to stress rupture models.** Solomon, A.A.; Hsu, F. (School of Nuclear Engineering, Purdue University, West Lafayette, IN 47907). *Acta Metallurgica;* **31**: No. 3, 453-464(Mar 1983). Contract AC02-80ER10591.

Swelling and gas release were studied using pure nickel as a model metallic system. 'Green' powder compacts were sintered in a high pressure argon atmosphere until pores closed and gas was entrapped. When the ambient high pressure was reduced, the compact swelled until pores interconnected and the gas was released. Gas release was detected by a quadrupole mass spectrometer system. Microstructure evolution during swelling and gas release was examined by scanning electron microscopy and quantitative microscopy. The pore size and form factor distributions were measured and pores were found to reside primarily at the grain boundaries. For pure nickel, the swelling driving force. $DF = p - P - 2\gamma/r$ (where p is the internal pore pressure, P is the external pressure, $\gamma$ is the surface energy and r is the pore radius) may be completely determined using this technique. For low driving forces and high density, a linear relationship was found between the swelling strain-rate and the driving force. At higher driving forces and lower density, a non-linear relationship was found.

2735 **Nucleation and evolution of strain-induced martensitic (b.c.c.) embryos and substructure in stainless steel: a transmission electron microscope study.** Staudhammer, K.P.; Hecker, S.S.; Murr, L.E. (Los Alamos National Laboratory, Los Alamos, NM 87545). *Acta Metallurgica;* **31**: No. 2, 267-274(Feb 1983).

The deformation of type 304 stainless steel produces a preponderance of strain-induced /chi/ (b.c.c.) martensite, which nucleates as stable embryos at micro-shear band or twin-fault intersections as proposed by Olson and Cohen. The two intersecting micro-shear bands must have a specific defect (fault-displacement) structure, and for stable martensite embryos to form requires a minimal micro-shear band thickness ranging from 50-70 A. The critical nature of nucleation is influenced by the local temperature and strain. The structure, geometry, and morphology of strain-induced martensite embryos is essentially invariant regardless of the strain rate, strain state or temperature. Larger volume fractions of martensite evolve at large strains (≧ 20%) as a result of embryo coalescence to produce a blocky-type morphology. Martensite embryos and coalesced volume elements of /chi/ are frequently characterized by an irregular non-homogeneous distribution of smaller b.c.c. regimes which result from the irregular satisfaction of the necessary and specific fault-displacement requirements within a larger intersection volume.

2736 **Quantitative fractography and dislocation interpretations of the cyclic cleavage crack growth process.** Gerberich, W.W.; Jatavallabhula, K. (Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue S.E., Minneapolis, MN 55455). *Acta Metallurgica;* **31**: No. 2, 241-256(Feb 1983). Contract AC02-79ER10433.

Fractographic features of cyclic cleavage crack growth in Fe and Fe-binary alloys as a function of applied stress intensity and test temperature are documented. Cyclic striations, cleavage river and twist angle misorientations are measured and discussed in terms of geometrical and local stress considerations. It is shown that the river height displacement must account for both twist angle misorientation between adjacent grains and the crack-tip opening displacement of an advancing fatigue crack. With regards to the rate of an advancing cleavage crack, a dislocation dynamics model is derived which qualitatively gives the correct ordering of power-law slopes (da/dN vsΔK) and growth rate magnitudes as a function of test temperature.

2737 **Calculation of self-consistent potentials for substitutionally disordered systems with application to the Ag/sub x/-Pd/sub 1-x/ alloy series.** Winter, H.; Stocks, G.M. (Kernforschungszentrum Karlsruhe, Institut fuer Technische Physik, 7500 Karlsruhe, Postfach 3640, Federal Republic of Germany). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 882-904(15 Jan 1983).

Previous Korringa-Kohn-Rostoker coherent-potential-approximation electronic-structure calculations for substitutionally random alloys have been based on ad hoc potentials. The lack of procedures suitable to provide self-consistent, parameter-free potentials prevented computations for systems consisting of dissimilar atoms and is also the reason why quantities like, for example, cohesive energies or lattice constants, have not so far been evaluated for systems of similar constituents. We present in full detail a generally applicable scheme devised for calculating the self-consistent electronic structures of substitutionally disordered systems. Its feasibility is demonstrated by presenting the results obtained for the Ag/sub x/Pd/sub 1-x/ alloy series. They are compared with those of former non-self-consistent calculations which use Mattheiss prescription potentials and the $\alpha = 1$ Slater exchange, whereas the von Barth—Hedin expression is employed in our work. The differences are perceptible and have to be understood as combined self-consistency and exchange-correlation effects. .ID BW2039 .PG 905 909

2738 **Comment on "Prediction of Fermi-surface pressure dependence in Rb and Cs".** Schirber, J.E.; Beardsley, G.M. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 1363-1364(15 Jan 1983). Contract AC04-76DP00789.

We present experimental evidence for formation via pressure of a multiply connected Fermi surface in Cs, resulting from contact of the Fermi surface with the Brillouin zone, for direct comparison with the predictions of the volume-dependent band calculations of Jan, MacDonald, and Skriver. Agreement is found to be excellent.

2739 **Evolution of a metal: A photoemission study of the growth of Pd clusters.** Colbert, J.; Zangwill, A.; Strongin, M.; Krummacher, S. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 1378-1381(15 Jan 1983).

Photoemission spectroscopy of Pd clusters embedded in a metal supported Xe matrix is used to monitor continuously the transition from atomic to bulk metallic behavior. We observe the evolution of both the Pd electronic states and the influence of the metal clusters on the initial- and final-state energy shifts of the Xe valence levels. The latter reflect the classical electrostatic equilibration of the metal Fermi levels and the screening response of the metal clusters, respectively.

2740 **High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons.** Severin, C.S.; Chen, C.W. (Tektronix Incorporated, Beaverton, Oregon 97077). *Journal of Applied Physics;* **53**: No. 11, 7744-7746(1 Nov 1982).

Amorphous $Fe_{87}B_{11}Au_2$ ribbons that are stable above 300 K displayed saturation magnetization M/sub s/ of 223 emu/g at 4.2 K. The deduced average Fe atomic moment mu-bar/sub Fe/ was 2.46 μ/sub B/, which is relatively high compared to mu-bar/sub Fe/ = 2.13 μ/sub B/ in $Fe_{87}B_{13}$. The higher Fe moment is attributed to a quenched-in, high-volume Fe lattice (similar to that found in amorphous Fe-Au films) stabilized by Au and B atoms. Upon annealing, three crystallization stages were observed. First, a α-Fe phase with about 3 at.% Au emerged at around 620 K followed by a $Fe_2B$ phase at roughly-equal745 K. At roughly-equal790 K, a Au-rich phase emerged. There were decreases in M/sub s/ (4.2 K) as the isothermal annealing temperature was increased, with the largest decrease coinciding with the precipitation of $Fe_2B$.

2741 **Magnetism in transuranics (invited).** Smith, J.L.; Fisk, Z. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Applied Physics;* **53**: No. 11, 7883-7886(1 Nov 1982).

Transuranic materials exhibit all types of magnetic behavior. This behavior is a relatively smooth function of atomic number and of the atomic volume of the atoms in the materials. The systematics are best described in terms of these volumes as a measure of intinerancy, mixed valence, or local moment formation.

2742 **Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$.** Stassis, C.; Loong, C.; Zarestky, J.; McMasters, O.D.; Moon, R.M.; Thompson, J.R. (Ames Laboratory and Department of Physics, Iowa State University, Ames, Iowa 50011). *Journal of Applied Physics;* **53**: No. 11, 7890-7892(1 Nov 1982).

Polarized neutron scattering techniques have been used to obtain information regarding the ground state electronic properties of the intermediate valence compound $CePd_3$. The spatial distribution of the magnetization induced by a magnetic field of 42.5 kG in a single crystal of $CePd_3$ has been studied at 100 and 4.2 K. We find that at 100 K the measured form factor is in good agreement with the free-ion 4f magnetic form factor of $Ce^{3+}$. At 4.2 K on the other hand, deviations from a 4f magnetic factor were observed. An adequate fit to the experimental data taken at 4.2 K can be obtained by assuming that the induced magnetization contains a significant component (~17% of the total) of Ce—5d electronic character.

2743 **Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$.** Thompson, J.R.; Sekula, S.T.; Loong, C.; Stassis, C. (Department of Physics, University of Tennessee, Knoxville, Tennessee 37996). *Journal of Applied Physics;* **53**: No. 11, 7893-7895(1 Nov 1982).

The electrical resistivity and magnetization have been measured for a high quality single crystal of the intermediate valence compound $CePd_3$. The magnetization was measured in the temperature range 4—175 K. After correcting for a small Curie-like impurity contribution, the susceptibility chi decreased with increasing temperature from the 4 K value of $1.85 \times 10^{-3}$ emu/mole of $CePd_3$. The electrical resistivity rho was measured from 1.2—300 K. A resistance ratio rho(300 K)/rho(4.2 K) = 11.5 was obtained. At low temperature ($T<8$ K), rho varied quadratically with temperature having an intercept of $9.3 \times 10^{-8}$ Ω m at 0 K.

2744 **Magnetic moment distribution in Fe/sub 0.68/ $^{60}$Ni/sub 0.32/.** Cable, J.W.; Brundage, W.E. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Journal of Applied Physics;* **53**: No. 11, 8085-8087(1 Nov 1982).

The polarized-neutron, diffuse scattering method was used to investigate the magnetic moment distribution in Fe/sub 0.68/ $^{60}$Ni/sub 0.32/. The measurements were made on an isotopic single crystal at 295 K in a magnetizing field of 2.0 T. These yield a difference in average moments of 0.46 μ/sub B/ which can be combined with the known magnetization of 0.95 μ/sub B/ to give average ferromagnetic moments of 1.10 μ/sub B//Fe and 0.64 μ/sub B//Ni. Pronounced local environment effects are observed, and these are negative except for the second neighbor effect. This sign sequence suggests the presence of some antiparallel alignment of Fe moments.

2745 **Internal magnetic fields in hcp-iron.** Taylor, R.D.; Cort, G.; Willis, J.O. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Applied Physics;* **53**: No. 11, 8199-8201(1 Nov 1982).

The magnetic behavior of hcp-Fe (epsilon iron) has been investigated by the Moessbauer Effect over a wide range of temperature T, pressure P, and applied magnetic field $H_0$. The internal field H/sub i/ of the induced moment is given by H/sub i/ = 0.20 +- 0.01 $H_0$ and is independent of T and P. Enhanced paramagnetism is suggested as the most likely origin for a contribution of this magnitude to H/sub i/.

2746 **Critical-field measurements in Nb-Ti compositon-modulated alloys.** Qian, Y.J.; Zheng, J.Q.; Sarma, B.K.; Yang, H.Q.; Ketterson, J.B.; Hilliard, J.E. (Northwestern University, Evanston, Illinois). *Journal of Low Temperature Physics;* **49**: No. 3, 279-294(1 Nov 1982).

We present measurements of the transition temperature and upper parallel critical field, to 15 kG, of layered Nb-Ti alloys for layer wavelengths between 6 and 6250 A.

2747 **Scandium oxide coatings for high-power UV laser applications.** Rainer, F.; Lowdermilk, W.H.; Milam, D.; Tuttle Hart, T.; Lichtenstein, T.L.; Carniglia, C.K. (The first three authors named are with University of California, Lawrence Livermore National Laboratory, P.O. Box 5508, Livermore, California 94550; the other authors are with Optical Coating Laboratory, Inc., P.O. Box 1599, Santa Rosa, Californiia 95403.). *Applied Optics;* **21**: No. 20, 3685-3688(15 Oct 1982). Contract W-7405-ENG-48.

Scandium oxide has proved to be a damage-resistance high-index material in laser coatings for use at 248 nm. The results of damage threshold measurements on laser reflectors and antireflection coatings of various designs, material combinations, and deposition temperatures are presented. The most significant effects are observed for overcoat layers on high reflectors and undercoat layers on antireflection coatings. Thresholds >6 J/cm² for 20 nsec pulses were observed in both cases.

2748 **Materials behaviour in the liquid alkali metals lithium and sodium.** Frankham, S.A. Nottingham, England; Nottingham University (Sep 1982). 334p. Available from British Library, Boston Spa, Wetherby, West Yorks. No. D44775/83.

The subject is covered in chapters, entitled: introduction; solubilities in liquid Li and thermodynamic properties of Li salts; corrosion of refractory metals by liquid Li - a review; corrosion of iron base alloys by liquid Li; experimental techniques; ternary Li-transition metal nitrides; corrosion of Ti and Zr by liquid Li; corrosion of V, Nb and Ta by liquid Li; corrosion of Fe, Cr and Ni by liquid Li; corrosion of type 316 stainless steel by liquid Li; mass transfer in liquid Li systems; impurity monitoring in liquid Li; use of EMF cells to measure oxygen in liquid Na; the free energies of formation of $NaCrO_2$, $NaVO_2$, $NaMnO_2$ and $NaAlO_2$; the free energies of formation of $Na_3NbO_4$, $Na_3TaO_4$ and $Na_2WO_4$; the Na-Ce-O system; the exposure of some compounds to liquid Na of low velocity and 15 w.p.p.m. oxygen content.

2749 **Long term corrosion of Cr-Mo steels in superheated steam at 482 and 538 C.** Griess, J.C.; DeVan, J.H.; Maxwell, W.A. (Oak Ridge National Lab., TN). *Materials Performance;* **21**: No. 1, 18-24(Jan 1982). Contract W-7405-ENG-26.

From Corrosion/81; Toronto, Ontario, Canada (Apr 1981).

The corrosion of several Cr-Mo ferritic steels was investigated in superheated steam at an operating power plant. Tests were conducted at 482 and 538 C (900 and 1000 F) in a once-through loop for times up to 28,000 hours (3.2 years). Chromium concentrations ranged from 2.0 to 11.4%, and the effect of surface preparation on corrosion was investigated. Only one of many specimens showed evidence of exfoliation at 482 C, but at 538 C, exfoliation occurred on at least some of the specimens of most materials; the exceptions were the alloy with the highest chromium content (Sandvik HT-9), one heat of 9 Cr-1 Mo steel with the highest silicon content, and Sumitomo 9 Cr-2 Mo steel, which was in test for only 19,000 hours. Parabolic oxidation kinetics adequately described the corrosion process for about the first year, after which corrosion rates were constant, and lower than predicted from extrapolation of the initial part of the penetration versus time curves. With chromium concentrations between 2 and 9%, corrosion behavior was independent of chromium content, and corrosion was slightly less with Sandvik HT-9. Corrosion was nearly independent of surface preparation, but in two cases, the presence of mill scale on the surface prior to steam exposure seemed to retard oxidation in steam.

2750 **Superconducting $V_3Si$ produced by pulsed laser annealing.** Stritzker, B. (Oak Ridge National Lab., TN); Appleton, B.R.; White, C.W.; Lau, S.S. *Solid State Communications;* **41**: No. 4, 321-324(1982). Contract W-7405-ENG-26.

Pulsed laser annealing has been utilized to fabricate superconducting $V_3Si$ from multilayer V-Si thin film samples. It is demonstrated that a single laser pulse can induce mixing to form $V_3Si$ in the A15 phase. The effects of multiple laser pulses and post thermal annealing on the superconducting transition temperature and width are presented, and a model is proposed to explain the effects of rapid heating and cooling on the $V_3Si$ structure.

2751 **Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding.** Hobson, D.O. (Oak Ridge National Lab., TN); Thoms, K.R.; Dodd, C.V.; van der Kaa, Th. *American Society for Testing and Materials, Special Technical Publication;* No. 754, 173-192(1982). Contract W-7405-ENG-26.

Descriptions and results for seven of the eight in-reactor creepdown tests of Zircaloy fuel cladding, which were part of a joint program between the U.S. Nuclear Regulatory Commission and Energieonderzoek Centrum Nederland, are presented. These tests were conducted to study the behavior of Zircaloy fuel cladding under conditions that approximate those found in an operating pressurized-water power reactor. The most important conclusion to be drawn from this study involves the deformation of the cladding during testing. Contrary to similar tests conducted out-of-reactor, the in-reactor specimens did not deform uniformly, that is, by diametral contraction and smooth ovalization. Rather, the deformation surfaces were nonuniform with hills and valleys being formed at irregular intervals. This implies that conventional concepts of creep rate and simplified modeling procedures will not work for predicting cladding behavior. Sufficient data have been generated in this program to supply modelers with detailed descriptions of the cladding surface shapes from which new interpretations can be derived to predict cladding behavior.

2752 **Lectures presented to the 14th meeting of the Study Group 'Fracture Mechanics' and to the 7th meeting of the Study Group 'Fatigue Strength'.** Berlin, Germany, F.R.; Deutscher Verband fuer Materialpruefung e.V. (1982). 369p. (In German). (CONF-8205209—). Deutscher Verband fuer Materialpruefung e.V., Berlin (Germany, F.R.).

From 14. meeting of the study group fracturue mechanics and 7. meeting of the study group fatigue strength; Muelheim an der Ruhr, F.R. Germany (11 May 1982).

The joint meeting of the study groups "Fracture Mechanics" and "Fatigue Strength" was held from May 11-13, 1982 in Muelheim/Ruhr. The topic "Serviceable life predictions with a view to crack propagation" was the leading subject discussed by the experts in this field, whereas half a day at the beginning and at the end of the meeting was devoted to specific other problems put before the study groups. This volume presents all the papers read at the meeting. (orig./RW).

2753 **Electron tunneling spectroscopy of intermediate valence materials.** Guentherodt, G. (Koeln Univ. (Germany, F.R.). 2. Physikalisches Inst.); Thompson, W.A.; Holtzberg, F. (IBM Watson Research Center, Yorktown Heights, NY (USA)); Fisk, Z. (Los Alamos Scientific Lab., NM (USA)). pp 313-317 of Valence instabilities. Proceedings of the international conference held in Zurich, Switzerland, April 13-16, 1982. Wachter, P.; Boppart, H. (eds.) (Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik). Amsterdam, Netherlands; North-Holland (1982). (CONF-820454—).

From International conference on valence instabilities; Zurich, Switzerland (13 Apr 1982).

Includes author index.

Electron tunneling spectra of TmSe, SmS, $SmB_6$ and $CePd_3$ have been measured using the GaAs Schottky barrier probe tunneling method. TmSe shows an energy gap $2\Delta$ (FWHM) = 1.2 meV only in the antiferromagnetic phase. In situ pressure-transformed metallic SmS exhibits a gap $2\Delta = 1.7$ meV and $SmB_6$ shows a gap $2\Delta = 2.7$ meV, which is independent of magnetic field. For $CePd_3$ an inelastic excitation is found near +-14 meV, which is absent in $YPd_3$. An interpretation of the tunneling spectra in terms of quasiparticle excitation energies of bound electron-hole pairs is presented.

2754 **Determination of symmetry changes in ordered alloys by convergent beam electron diffraction.** Fraser, H.L. (Univ. of Illinois, Urbana). pp 54-56 of Microbeam analysis, 1982. Heinrich, K.F.J. (ed.). San Francisco, CA; San Francisco Press, Inc. (1982). Contract AC02-76ER01198.

Attempts have been made to separate out the effect of strain by making observations on the one hand on a single crystal of $\gamma'$ ($Ni_3Al$-based) alloyed with 7 at. % Ta, and on the other hand a $\gamma'$ in an eutectic alloy where the phase is subjected to very large stresses during thermal processing. Preliminary results are described.

2755 **Example of the use of combined techniques of analytical transmission electron microscopy for phase identification.** Konitzer, D.G.; Fraser, H.L. (Univ. of Illinois, Urbana). pp 393-398 of Microbeam analysis, 1982. Heinrich, K.F.J. (ed.). San Francisco, CA; San Francisco Press, Inc. (1982). Contract AC02-76ER01198.

Phase identification techniques include energy-dispersive x-ray spectroscopy (EDS), electron energy loss spectroscopy, and selected area and convergent beam electron diffraction, coupled with either conventional transmission or scanning transmission electron microscopy. This paper gives an example of phase analysis in a Ti-8Al-4Y alloy, where it is shown that it is often necessary to use a combination of these techniques to permit the determination of the identity of a given phase.

2756 **(BNL-tr—1008) Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen.** Windgassen, K.F.; Kesten, M. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. Translation of MGI Report No. 33/1982. 54p. NTIS, PC A04/MF A01. Order Number DE83017597.

Portions are illegible in microfiche products.

Steel tubes have been subjected to low frequency internal pressurization cycles with pure hydrogen gas. The samples had been fabricated from quenched and tempered steels 34 CrMo4 and 40 Mn4. Each specimen had a longitudinal machined V-notch. The incident of fatigue crack initiation at the root of the artificial defect was monitored by strain gauges. Results indicate that hydrogen has a major effect on the low cycle fatigue. It is concluded that structural components serving in hydrogen environments are fatigue safe, if the stress intensity of possible surface defects is below the determined initiation threshold.

2757 **Stress corrosion testing of 5083 aluminum.** Patterson, R.A. (Los Alamos Scientific Lab., NM). *Corrosion (Houston);* **37**: No. 8, 455-461(Aug 1981).

The stress corrosion susceptibility of thermomechanically processed 5083 aluminum-magnesium alloy was determined in a 3.5 Wt% sodium chloride environment. Alternate immersion C-ring and constant elongation rate tensile tests were performed. Comparison of the test results indicated that both techniques revealed the susceptibility of short transverse specimens to stress corrosion cracking. Potentiokinetic determinations of the characteristic pitting potential (Ep) and protection potential (Epp), were made. In deaerated 3.5 Wt% sodium chloride, Ep is -740 mV and Epp is -770 mV versus a standard calomel reference electrode. Standard tensile tests (air environment) were also conducted to generate base line strength data. The short transverse tensile specimens had a nominal 260 MPa (38 ksi) yield strength and 6.5% total elongation. Comparison of base line data with the stress corrosion data revealed that constant elongation rate test results are dependent upon a balance of normal ductile failure and the corrosion induced failure modes. Impressed potentials equal to or more noble than the pitting potential (Ep) generated the maxium degradation of mechanical properties while impressed potentials more negative than the protection potential (Epp) did not alter the mechanical properties of 5083 aluminum. Thus, the development of constant elongation rate tensile tests required an in-depth understanding of the corrosion mechanisms and the mechanical properties of 5083 aluminum. Alternate immersion C-ring tests generated specimen pass or fail information which indicated susceptibility of staticly loaded (80% of yield) specimens to stress corrosion induced failure. Tests results showed that only four of eight specimens tested contained stress corrosion failures.

2758 **Effect of thorium additions on metallurgical and mechanical properties of Ir-0.3 pct W alloys.** Liu, C.T.; Inouye, H.; Schaffhauser, A.C. (Oak Ridge National Lab., TN). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **121**: 993-1002(Jun 1981). Contract W-7405-ENG-26.

Metallurgical and mechanical properties of Ir-0.3 pct W alloys have been studied as a function of thorium concentration in the range 0 to 1000 ppm by weight. The solubility limit of thorium in Ir-0.3 pct W is below 30 ppm. Above this limit, the excess thorium reacts with iridium to form second-phase particles. Thorium additions raise the recrystallization temperature and effectively retard grain growth at high temperatures. Tensile tests at 650°C show that the alloy without thorium additions (undoped alloy) fractured by grain-boundary (GB) separation, while the alloys doped with less than 500 ppm thorium failed mainly by transgranular fracture at 650°C. Intergranular fracture in the doped alloys is suppressed by GB segregation of thorium, which improves the mechanical properties of the boundary. The impact properties of the alloys were correlated with test temperature, grain size, and heat treatment. The impact ductility increases with test temperature and decreases with grain size. For a given grain size, particularly in the fine-grain size range, the thorium-doped alloys are much more duc-

tile and resistant to GB fracture. All of these results can be correlated on the basis of stress concentration on GBs by using a dislocation pileup model.

2759 **The thermal expansion of the directionally solidified Al-$CuAl_2$ eutectic.** Baker, D.F.; Bragg, R.H. (Lawrence Berkeley Lab., CA). *Journal of Crystal Growth;* **12A**: 95-100(Jan 1981). Contract W-7405-ENG-48.

Alloys of Al-$CuAl_2$ eutectic composition were prepared from 99.999 pct pure materials and directionally solidified in a temperature gradient of about 45°C/cm at different growth rates R. The $\lambda^2 R$ = constant relation was verified and lamellar spacings of 7.5, 3.5, 2.6, 1.8 and 1.4 μm were obtained. Dilatometer specimens were machined with axes aligned in the principal lamellae coordinate directions. Thermal expansion was measured by standard dilametry (Cu standard) using a set point program cycling between room temperature and 500°C. Thermal expansion of the directionally solidified Al-$CuAl_2$ eutectic is greatest in the growth direction (in the plane of the lamellae), least in the tranverse direction (orthogonal to the growth direction in the plane of the lamellae) and intermediate in the direction normal to the lamellae. The most significant finding of the study is that the thermal expansion increases with decreasing lamellar spacing between limits defined approximately by the thermal expansion of the $CuAl_2$ phase alone and the predicted thermal expansion of an isotropic elastic model of the composite.

2760 **Sulfur and phosphorus segregation to creep cavities and grain boundaries in 304 SS.** White, C.L.; Padgett, R.A.; Swindeman, R.W. (Oak Ridge National Lab., TN). *Scripta Metallurgica;* **15**: 777-782(1981). Contract W-7405-ENG-26.

Swindeman, Farrell, and Yoo recently reported on a particular heat of type 304 stainless steel in which failure by microcavity coalescence occurred in unusually short times with low creep ductility. Both optical and scanning electron microscopy indicated that failure occurred via growth and linkage of microcavities on grain boundaries oriented normal to the applied tensile stress. Nothing in the chemical composition or processing history of this material seemed to explain this behavior. In particular, the bulk sulfur and phosphorus levels in this alloy are typical of 304 stainless steel. Transmission electron microscopy of "as received" stock did, however, reveal the presence of small (5-50 nm diameter) cavities attached to grain boundary precipitates. The existence of pre-existing cavities would, of course, obviate cavity nucleation during creep and presumably shorten creep life.

2761 **Activation volume for steady state creep in polycrystalline CsCl: cesium chloride structure.** Heard, H.C. (Lawrence Livermore National Lab., CA); Kirby, S.H. pp 83-91 of Mechanical behavior of crystal rocks. Geophysical monograph 24. Washington, DC; American Geophysical Union (1981). Contract W-7405-ENG-48.

Annealed polycrystalline samples of CsCl have been deformed in triaxial compression at 150°-400°C (T), at 0.1-400 MPa confining pressure (P), and at constant strain rates ($\epsilon$) ranging from $10^{-3}$ to $10^{-6}$ $s^{-1}$. Stress-strain data from these tests show mainly an elastic-plastic response, but with minor work hardening occurring at the lower temperatures and at the higher rates. At the values of T, P, and $\epsilon$ investigated, the steady state flow stress $\sigma$ ranged from 1.3 to 65 MPa. At similar T and $\epsilon$, $\sigma$ at 400 MPa was 2-4 times that at low P. This $\sigma$ increase with P is related to intracrystalline plasticity, not to dilatancy. Measured values of $\epsilon$, T, P, and $\sigma$ from 39 tests were fitted to a flow law of the form $\epsilon$ = B$\sigma$/sup N/ exp [-(Q* + PV*)/RT], where Q* is the activation energy and V* the activation volume for steady state flow. A least squares fitting routine was used to calculate B, N, Q*, and V*. Calculation of V/sub c/* from an empirical relation based on T/sub m//T and measured dT/sub m//dP on melting of the CsCl phase yields a much larger activation volume: 83 x $10^{-6}$ $m^3$/mol. Previously, the V/sub c/* has been calculated by Keyes' method baased on the shear and bulk moduli in isotropic materials or on this method as corrected for cubic solids. The range of values for V/sub c/* is so broad that they are of little use in estimating V*. Values for Q* and V* determined here are shown to be consistent with both the measured activation energy and a model activation volume for self-diffusion in CsCl based on vacancy diffusion mechanism.

2762 **NMR study of platinum catalysts.** Slichter, C.P. (Univ. of Illinois at Urbana-Champaign). *Surface Science;* **106**: 382-396(1981). Contract AC02-76ER01198.

The author reports on studies by his group of the $^{195}$Pt NMR of several samples of Pt supported on alumina at frequencies ranging from 9 to 74 MHz, and at 77 and 4.2 K, using spin-echoes at fixed frequency. The NMR spectra are exceedingly broad, extending from the value characteristic of bulk metallic Pt to a value characteristic of diamagnetic Pt compounds (a range of 4.5 kG at 74 MHz). The detailed shapes vary drastically with average particle size, and exhibit structure which depends on the chemical treatment of the Pt surface. The spin-spin and spin-lattice relaxation times $T_2$ and $T_1$ respectively, vary across the absorption line but, for a given surface treatment, and at a given position on the absorption line, $T_1$ and $T_2$ are the same in all three samples. In sample 3, there is a sharp peak at the position of the $^{195}$Pt resonance in bulk metal, but is missing in the samples of smaller particle size. In samples exposed to the air or to hydrogen, there is a strong peak near the normal position of the $^{195}$Pt resonance in diamagnetic compounds which we believe arises from the surface layer of Pt atoms since its area relative to the total absorption line agrees with Sinfelt's chemical determination of the sample dispersion and since the peak disappears when the surface is cleaned chemically. When the surface is covered, the electrons of the surface platinum atoms are tied up in chemical bonds (i.e., are non-metallic) since the surface peak occurs at the position characteristic of $^{195}$Pt in diamagnetic compounds, possesses a long $T_1$, and has $T_1$ whose temperature and magnetic field dependence differ drastically from $T_1$ in metals.

2763 **Interface structure of some precipitates in austenitic stainless steels.** Bentley, J. (Oak Ridge National Lab., TN). pp 292-293 of 39th annual proceedings of the electron microscopy society of America. Bailey, G.W. (ed.). Atlanta, GA; Electron Microscopy Society of America (1981). Contract W-7405-ENG-26.

Interphase boundaries often play a dominant role in high-temperature materials properties such as deformation and fracture or radiation damage. A detailed knowledge of the interfacial structure is required to understand the relationship between microstructure and properties. High-resolution TEM observations have been made of the interfacial structure of two carbides ($M_{23}C_6$ and MC) and an intermetallic compound (sigma) in 300 series austenitic stainless steels. Precipitates with well-defined orientation relationships and interface planes were chosen in order that the determined structures would be generally applicable in a range of property-structure correlations.

2764 **Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/.** Huang, S.Z. (Univ. of Houston, TX); Wu, M.K.; Meng, R.L.; Chu, C.W.; Smith, J.L. *Solid State Communications;* **38**: 1151-1153(1981).

The ferromagnetism in TiBe/sub 2-X/ Cu/sub X/ and ZrZn/sub 1.9/ has been found to be reversibly suppressed by hydrogenation. However, no sign of superconductivity was detected down to 1.2 K with the complete suppression of the ferromagnetic ordering. The magnetism-suppression is attributed to defects induced by hydrogenation.

2765 **Hydrogen chemisorption on silicon (100) 2 x 1.** Madden, H.H. (Sandia National Lab., Albuquerque, NM). *Surface Science;* **105**: 129-144(1981). Contract AC04-76DP00789.

Changes in the valence band density of states (DOS) of a (100) silicon surface that accompany the chemisorption of atomic hydrogen onto that surface are deduced from a study of the changes in the L/sub 2,3/VV Auger lineshape. Complementary changes in the conduction band DOS are inferred from changes in L/sub 2,3/-core-level characteristic loss spectra (CLS). The chemisorbed hydrogen layer is identified as the dihydride phase from low energy electron diffraction measurements. Upon hydrogen adsorption the DOS at the top of the valence band decreases and new energy levels associated with the Si-H bonds appear lower in the band. Assuming that the Auger signal from the hydrogen covered sample consists of a superposition of a signal from silicon atoms

bonded to hydrogen in the dihydride layer and an elemental-Si signal from the substrate, a N(E) difference spectrum with features due only to the dihydride is obtained by subtracting the background corrected, loss deconvoluted L/sub 2,3/VV signal for a clean (100)Si surface from the corresponding signal for the hydrogen covered surface. Comparisons of the energy position of the major peak in this difference spectrum with that of the main peak in a gas phase silane Si-L/sub 2,3/VV spectrum, and of the corresponding Auger energy calculated empirically, indicate a hole-hole interaction energy of ~8 eV for the two-hole final state in the gaseous system and zero for the dihydride surface system. Hydrogen induced changes in the conduction band DOS are less apparent than those of the valence band DOS. Hydrogen induced changes in the near-elastic electron energy loss spectra (ELS) are also reported and compared with previously published ELS results.

2766 **Stabilization of $\beta$-Be at room temperature by a rapid quench technique.** Holt, J.B.; Magana, J.W.; Ankeny, D.C.; Cline, C.F. (Lawrence Livermore Lab., CA). *Scripta Metallurgica;* **14**: 979-982(1980). Contract W-7405-ENG-48.

The retention of the $\beta$-Be phase at room temperature by the use of a rapid quench technique opens the way for a full investigation of its physical properties. Amonenko found the $\alpha$-$\beta$ transition at about 1250°C is accompanied by a number of significant changes in properties. For example, there is a sharp increase in the positive slope of the resistivity vs temperature curve. With the $\beta$-structure material available at room temperature, a number of valuable studies of properties may now begin. Included within these studies are thermal response, hardness, electrical resistivity, structural analysis, and superconductivity.

2767 **Metal surface deformation and subsurface defect structure: a microscopy correlation study.** Carpenter, R.W. (Oak Ridge National Lab., TN); Wert, J.J.; Caldwell, S.G. pp 140-141 of 38th Annual Proceedings of the Electron Microscopy Society of America. Bailey, G.W. (ed.). San Francisco, CA; Electron Microscopy Society of America (1980). Contract AC05-76OR00033;W-7405-ENG-26.

When a metal surface is deformed by indentation, sliding wear or similar methods, the crystal volume below the surface deformation trace contains an array of dislocations whose density varies with position relative to the surface deformation trace. It has been shown that the combined imaging modes (TEM/STEM and SEM) of an analytical electron microscope permit convenient and direct correlation between surface deformation markings and subsurface dislocation arrays in Al. In this note we report observations of deformation induced at room temperature by single stylus tracks on a Cu-8 wt % Al alloy.

2768 **Flux pinning in bronze-processed $Nb_3Sn$ wires.** Suenaga, M.; Welch, D.O. (Brookhaven National Lab., Upton, NY). pp 131-142 of Filamentary A15 superconductors. Suenaga, M.; Clark, A.F. (eds). New York, NY; Plenum Publishing Corporation (1980).

With the increasing importance of multifilamentary $Nb_3Sn$ conductors for technological uses such as for the production of very high magnetic fields in fusion magnets, means of improving the superconducting critical current density J/sub c/ at very high magnetic fields (H > 10 tesla) have been sought intensively, and it has been found that metallurgical factors such as heat treatment conditions, alloying additions, and mechanical strains can strongly influence the critical current density. The correlation of changes in J/sub c/ with such metallurgical variations in the $Nb_3Sn$ wires has been facilitated by the use of scaling laws for magnetic flux pinning in hard superconductors, and the scaling law developed by Kramer has been used frequently. It was found in the course of these investigations of the properties of monofilamentary $Nb_3Sn$ wires produced by the "bronze process" that the magnetic field dependence of J/sub c/ at high fields can qualitatively be characterized well by Kramer's scaling law. However, when a detailed comparison of the scaling law and available experimental results was made, serious inconsistencies in the values of the parameters which appear in the scaling equation were found. In this article, those instances where the equation appears to work well and other cases where the use of the equation leads to unrealistic results will be pointed out.

2769 **MC precipitate characterization in austenitic stainless steel.** Maziasz, P.J.; Carpenter, R.W. (Oak Ridge National Lab., TN). pp 384-385 of 38th Annual Proceedings of the Electron Microscopy Society of America. Bailey, G.W. (ed.). San Francisco, CA; Electron Microscopy Society of America (1980). Contract W-7405-ENG-26.

MC precipitate particles in austenitic stainless steels have an important and unique effect on radiation response of these materials in a fusion reactor environment. In this note we describe initial observations of one crystallographic and morphological variant of MC in austenite, which is the dominant variant formed during neutron irradiation in HFIR.

2770 **A form of Hall-Petch law for the strength of glassy metals.** Murr, L.E. (New Mexico Inst. of Mining and Tech., Socorro). *Physica Status Solidi [Sectio] A: Applied Research;* **61**: K101-K107(1980).

It is now fairly well established that quantitative studies involving mechanical-thermal treatments of polycrystalline metals and alloys show a relationship of grain size, subgrain size, dislocation cell size, or other microstructural dimensions relating a deformation-gradient wavelength $\lambda$, to flow stress or yield stress through a relationship of the form $\sigma = \sigma$/sub o/ + K/sub s/$\lambda^{-}$/sup m/, where $\sigma$ is the flow or yield stress (defined as some engineering offset yield stress), $\sigma$/sub o/ is the so-called friction stress (which is best determined from single crystal data, K/sub s/ is a constant sometimes referred to as the Petch constant or specific boundary strength; $\lambda$ is, in the context of plastically deforming, non-homogeneous materials described by Ashby, a wavelength equal to the spacing between the corresponding phases or microstructure, and m has been shown to vary from 0.25 to greater than 1 depending upon the nature of the microstructure, particularly the structure and orientation of subgrains, sub-cells, and other interfaces. When $\lambda$ corresponds to the grain size (or average grain diameter) ($\lambda$ = D) and m = 0.5, the equation is referred to as a "classical" Hall-Petch relationship or Hall-Petch law, which in the context of grain size has been shown to be adhered to by essentially all polycrystalline materials.

2771 **Beryllium-containing high specific strength amorphous alloys.** Holt, J.B.; Ankeny, D.C.; Cline, C.F. (Lawrence Livermore Lab., CA). *Scripta Metallurgica;* **14**: 959-962(1980). Contract W-7405-ENG-48.

The search for high-specific strength alloys containing beryllium, which can be melt-spun, covered a large number of both binary and ternary alloys. No binary and only three ternary alloys were able to be synthesized into amorphous ribbon. The results for the binaries are entirely consistent with the empirical equation which predicted that none of the alloys should form amorphous material. There are other binary eutectics such as $Be_{20}Pd_{80}$ and $Be_{20}Au_{80}$ which should be able to be melt-spun into amorphous ribbon, but they have no application in the field of high specific strength.

2772 **Temperature-dependent behavior of positron annihilation in metals.** Fluss, M.J.; Gupta, R.P.; Smedskjaer, L.C.; Siegel, R.W. (Argonne National Lab., IL). pp 243-270 of Advances in chemistry series, no. 175, positronium and muonium chemistry. Ache, H.J. (ed.). Washington, DC; American Chemical Society (1979).

The experimental techniques used to study defects by positron annihilation spectroscopy (PAS) are described briefly. Application of the two-state trapping model (TSTM) to the extraction of monovacancy formation enthalpies, H/sub 1v//sup F/, in metals from PAS data is shown to have limitations. The parameters entering the TSTM are potentially temperature dependent, and a degree of uncertainty in these parameters is reflected in the determination of H/sub 1v//sup F/. A practical consequence of these uncertainties is a present limitation of 3-5% in the accuracy of PAS measurements of H/sub 1v//sup F/ in metals. Lifetime experiments yield one method by which the uncertainties in the temperature-dependent parameters of the TSTM, except for the trapping rate per unit concentration of vacancies, can be taken into account naturally.

2773 **An evaluation of current models for the propagation of stress-corrosion cracks.** Bursle, A.J.; Pugh, E.N. (Univ. of Illinois, Urbana). *TMS (The Metallurgical Society) Paper Selection;* 18-47(1977). Contract AC02-76ER01198.

From TMS-AIME Fall Meeting; Chicago, IL, USA (24 Oct 1977).

The current models for SCC are described and evaluated in terms of existing fractographic evidence. It is concluded that the film-rupture model, which is considered to advocate propagation by continuous anodic dissolution, is consistent with the fractography of the majority of intergranular failures but cannot be reconciled with that of transgranular SCC. The latter appears to occur by discontinuous cleavage and is best accounted for by a bulk-embrittlement mechanism such as hydrogen embrittlement or the model based on selective dissolution. The fractographic evidence suggests that certain intergranular failures may also occur discontinuously, again indicating that a bulk-embrittlement model may be operative. In its present form, the tunnel model does not appear to be consistent with the fractographic observations, nor does the adsorption model seem to have wide application. The tarnish-rupture model, proposed for the brass-ammonia system, is also discarded on the basis of the fractographic evidence.

2774 **(RFP-Trans—414) Test of electrolytic method for separating bismuth and lead in saline melts.** Roms, Yu.G.; Belen'kii, B.S.; Kosmatyi, Yu.E.; Delimarskii, Yu.K. Translated from *Khimicheskaya Promyshlennost Ukrainy ;* No. 4, 26-27(1969). Contract AC04-76DP03533. 4p. NTIS, PC A02/MF A01. Order Number DE84002811.

A new simplified method has been developed for obtaining and refining bismuth and lead in saline melts. The impurities are extracted from the crude bismuth acting as the anode via electrolysis in a melt of eutectic mixture of alkaline and alkaline-earth metal halides. Being more electronegative than bismuth, the metals (lead, silver, iron) are anodically dissolved and pass into the electrolyte. When the parting potential is reached, they are precipitated onto the cathode, and the bismuth is concentrated on the anode.

2775 **Calculation of thermophysical properties of sodium.** Fink, J.K.; Leibowitz, L. (Argonne National Lab., IL). pp 165-173 of Thermophysical properties of solids and of selected fluids for energy technology. Sengers, J.V. (ed.). New York, NY; The American Society of Mechanical Engineers ([nd]).

The thermodynamic properties of sodium previously recommended by Padilla have been updated. As much as possible, the approach described by Padilla has been used. For sodium in the states of saturated liquid and vapor, subcooled liquid, and superheated vapor, the following thermodynamic properties were determined: enthalpy, heat capacity (constant pressure and constant volume), pressure, density, thermal expansion coefficient, and compressibility (adiabatic and isothermal). In addition to the above properties, thermodynamic properties inclucing heat of fusion, heat of vaporization, surface tension, speed of sound and transport properties of thermal conductivity, thermal diffusivity, emissivity, and viscosity were determined for saturated sodium.

2776 **Preliminary small angle neutron scattering investigations of neutron irradiation produced voids.** Spooner, S. (Georgia Inst. of Tech., Atlanta); Reitz, W.E.; Child, H.R. pp 397-409 of Advanced techniques for characterizing microstructures. Wiffen, F.W.; Spitznagel, J.A. (eds.). Washington, DC; The Metallurgical Society ([nd]). Contract W-7405-ENG-26.

The preliminary structure analysis of neutron irradiation-produced voids has been undertaken with small angle neutron scattering (SANS) at the Oak Ridge Research Reactor (ORR) at Oak Ridge National Laboratory. Two investigations are discussed with emphasis on experimental technique. Scattering from a set of niobium-zirconium alloys doped with boron to produce helium during irradiation was measured to estimate the average void radius and void fraction in samples irradiated under various conditions. The scattering measured from an irradiated 304 stainless steel sample exhibited intervoid interference effects. Magnetic fields were applied to the steel sample to try to find evidence of scattering from ferromagnetic precipitates. Such scattering was not observed at a significant level.

## 3602 Ceramics, Cermets, And Refractories

*REFER ALSO TO CITATION(S) 1925, 1926, 2217, 2465, 2680, 2747, 2932, 3111*

2777 **(CEA-CONF—6652) Physical properties of boron carbide.** Beauvy, M.; Guery, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Apr 1983. 27p. (CONF-8304124—5). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704304.

From Specialist meeting on absorbing pins and materials; San Francisco, CA, USA (11 Apr 1983).

The effects of microstructure of boron carbide on physical properties were studied to determine limitations on the uses of the material under irradiation. A thermal conductivity model was developed including the total porosity and the grain size of the boron carbide pellets. The effect of stoichiometry and $^{10}B$ enrichment were also investigated. The heat transport from room temperature to 1800°C is mainly the results of diffusion of phonon and collisions phonon-phonon. Thermal conductivity after fast neutron irradiation to $80.10^{20}$ capture.cm$^{-3}$ became lower and the mechanism of heat transport was affected. After irradiation thermal expansion and crystal cell volume of boron carbide were higher. Then, the melting point depends on stoichiometric ratio because the boron carbide phase is a solid-solution. On the carbon-rich side with more than 20 at. % of C, the variation of the melting point with composition could reached 200°C.

2778 **(CEA-CONF—6655) Boron carbide in pile behaviour Rapsodie experience.** Kryger, B.; Colin, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Apr 1983. 29p. (CONF-8304124—6). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704305.

From Specialist meeting on absorbing pins and materials; San Francisco, CA, USA (11 Apr 1983).

Results concerning boron carbide irradiation experiments performed in RAPSODIE up to $10^{22}$.cm$^{-3}$ capture density in the temperature range 600-1100° lead to the following main conclusions: initial density and grain size lowering contribute to swelling decrease but density is the major parameter for swelling limitation; swelling rate can vary in a wide range (ratio 1 to 3) according to combinations of density (1.8 to 2.3) and grain size (10 to 50 $\mu$m) values; a swelling balance reveals that the most important contribution to swelling should be a high density of helium small bubbles (<400 A); helium retention increases with density and grain size and decreases with temperature elevation. A diffusion law is proposed to describe the rate of helium release.

2779 **(CONF-821057—7) Magnetic form factor measurements in cerium hexaboride.** Burlet, P.; Boucherle, J.X.; Rossat-Mignod, J.; Cable, J.W.; Koehler, W.C.; Kunii, S.; Kasuya, T. (Oak Ridge National Lab., TN (USA); CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Lab. de Diffraction Neutronique; Tohoku Univ., Sendai (Japan). Faculty of Science). Oct 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE84002000.

From International conference on the impact of polarized neutrons on solid state chemistry and physics; Grenoble, France (15 Oct 1982).

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The results of a polarized neutron study of eh magnetic form factor of $Ce^{3+}$ ions in $CeB_6$ are described. This form factor does not show the anisotropy characteristic of a $\Gamma_7$ doublet, then the ground state of $Ce^{3+}$ ions in $CeB_6$ cannot be a well isolated $\Gamma_7$ doublet ($\Delta > 20$ K).

2780 **(DOE/ER/10956—5) Detection of the change in mean inner potential at dislocations in grain boundaries in NiO.** Ruehle, M.; Sass, S.L.;. (Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.). Inst. fuer Werkstoffwissenschaften; Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering). Aug 1983. Contract AC02-81ER10956. 50p. NTIS, PC A03/MF A01. Order Number DE84003015.

Portions are illegible in microfiche products.

An electron microscope imaging technique is described which is sensitive to the change in mean inner potential associated with the core region of dislocations in NiO. Through focus series of end-on dislocations in grain boundaries in NiO imaged under kinematical conditions show characteristic contrast behaviour related to the presence of a change in mean inner potential. Theoretical contrast calculations confirmed that the origin of the image contrast is a decrease in mean inner potential. The origin of this decrease could be a change in density at, a charge on, or local segregation at the dislocation core. Fitting of the calculated images to the observations allows a semi-quantitative estimate of the decrease in mean inner potential. If this decrease is related entirely to the decrease in density, there is poor agreement with the predictions of theoretical models of the dislocation core structure in NiO.

2781 (INIS-BR—79, pp 159-162) **Physical mechanisms responsible by the spectral properties of selective surfaces.** Krenzinger, A.; Corbella, O.D. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Programa de Pos-graduacao em Engenharia Metalurgica e dos Materiais). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Surface selectivities caused by the surface roughness, shell interference and deposition of a semiconductor on a metal are shown. Selective surfaces of copper oxide are discussed.

2782 (INIS-BR—79, pp 203-207) **Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS).** Gonzalez, C.O. de (Comision de Investigaciones Cientificas, Buenos Aires (Argentima)); Garcia, E. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A formulation for perform quantitative surface analysis by XPS spectra obtained with the help of a vacuum generator ESCA equipment is presented.

2783 **Structural properties of titanium dioxide films deposited in an rf glow discharge.** Williams, L.M.; Hess, D.W. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* **1**: No. 4, 1810-1819(Oct 1983).

An rf glow discharge has been used to promote the reaction between titanium tetrachloride and oxygen in order to deposit thin films of titanium dioxide at low temperatures. Structural properties of the films have been studied as functions of deposition temperature (25 to 700 °C) and of substrate material (Si, sapphire, glass, NaCl, and Ti). Films deposited onto glass substrates were amorphous at temperatures less than 300 °C, anatase at 300 and 400 °C, a mixture of anatase and rutile at 500 °C, and only rutile at 600 °C and above. Films deposited on the other substrates showed similar behavior but the temperatures for specific crystalline forms differed for each substrate material. Deposition at low power densities and 400 °C resulted in large (~5 μm) anatase crystallites in 1—2 μm films.

2784 **Analysis of the stoichiometry and temperature dependence of cation diffusion in wustite, Fe/sub 1-delta/O.** McKee, R.A. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 6, 3007-3013(15 Sep 1983). Contract W-7405-ENG-26.

A generalized thermodynamic representation of diffusion in high-defect-concentration solids is reviewed. This formalism permits a description of diffusion phenomena (metal oxidation, ionic conductivity, thermomigration) in terms of equilibrium thermodynamic properties, the tracer diffusion coefficient, and the correlation factor. This phenomenological theory is then applied in an analysis of experimental data for chemical diffusion in Fe/sub 1-delta/O. Moreover, the theory-experiment comparison allows the ΔK parameter associated with an isotope strength measurement to be determined. With values of ΔK, the corresponding correlation factor that is obtained from an isotope strength measurement can be evaluated. It is seen that the correlation factor for iron diffusion in Fe/sub 1-delta/O decreases with an increase in the deviation in stoichiometry and decreases with an increase in temperature. These phenomena are discussed in terms of defect structures that have been proposed for this material.

2785 **Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite.** Kamitakahara, W.A.; Wada, N.; Solin, S.A.; Seaverson, L.M. (Kernforschungszentrum Karlsruhe, Institut fuer Angewandte Kernphysik I, Postfach 3640, D-7500 Karlsruhe 1, Federal Republic of Germany and Ames Laboratory and Department of Physics, Iowa State University, Ames, Iowa 50011). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 6, 3457-3464(15 Sep 1983).

Neutron scattering measurements have been carried out on the graphite intercalation compound $RbC_8$. Phonon dispersion curves were measured for c-axis longitudinal modes and for some transverse branches with wave vectors in the basal plane and polarization out of plane. For the latter, there is a strong deviation of the dispersion relation from that of pure graphite. In addition, a partial phonon density of states was determined for intercalate (Rb) vibrations by in-basal-plane inelastic scattering. Our analysis shows that a two-dimensional (2D) Born—von Karman model with nearest-neighbor Rb-Rb force constants cannot account for the intercalate mode spectrum. A three-dimensional model in which the Rb-Rb forces are due to an unscreened Coulomb interaction agrees well with the data, implying that conduction-electron screening of the Rb-ion motions is substantially reduced in $RbC_8$ relative to Rb metal.

2786 **Structure of $VO(H_2O)_5^{2+}$ in cross-linked poly(vinyl alcohol).** van Willigen, H. (Univ. of Massachusetts, Boston). *Journal of Physical Chemistry;* **87**: No. 18, 3366-3367(1 Sep 1983). Contract AC02-81ER10911.

In a recent paper on an electron spin echo study of $VO^{2+}$-water complexes in poly(vinyl alcohol) cages, structural and hyperfine data are given for the pentahydrate $VO(D_2O)_5^{2+}$. The data differ considerably from those derived from electron nuclear double resonance spectra. This paper addresses the question of the origin of the discrepancies. It is concluded that they must be attributed to shortcomings in the method of analysis of the spin echo modulation spectra. 1 table.

2787 **Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations.** Nave, S.E.; Haire, R.G.; Huray, P.G. (Physics Department, University of Tennessee, Knoxville, Tennessee 37996). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2317-2327(1 Sep 1983). Contract AS05-79ER10348;W-7405-ENG-26.

Magnetic susceptibility measurements have been made on multimicrogram quantities of $^{243}AmF_3$, $^{248}CmF_4$, $^{248}CmO_2$, and $^{248}CmBaO_3$ samples (nominally the $5f^6$ electronic configuration) and on $^{248}Cm_2O_3$, $^{248}CmF_3$, $^{249}BkF_4$, and $^{249}BkO_2$ (nominally the $5f^7$ electronic configuration) in the temperature range 4.2—300 K and in magnetic fields up to 1650 G. The experimentally determined effective magnetic moments and the Curie-Weiss constants for these compounds are presented. The deviation of the moments for the $5f^6$ compounds from those expected from classic theory is discussed in terms of low-lying excited states, chemical composition, crystal-field perturbations, and realistic electronic structure.

2788 **First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$.** Beri, A.C.; Lee, T.; Das, T.P.; Sternheimer, R.M. (Department of Physics, State University of New York at Albany, Albany, New York 12222). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2335-2351(1 Sep 1983).

A first-principles procedure is developed for the quantitative study of the widely differing Sternheimer antishielding effects that can be ascribed to the induced electric field gradients due to the

various sources of electric field gradient in ionic crystals. The method involves the perturbation of the electronic states in the crystal by the nuclear quadrupole moment of the central ion, and the use of these perturbed functions in an evaluation of components of the energy of the crystal which are linear in the quadrupole moment. With each term in this energy, one can associate an induced field gradient due to a specific source in the crystal and a specific perturbation of the central-ion charge distribution. We have applied this ab initio method to a study of the nuclear quadrupole interaction for /sup 57m/Fe in $Fe_2O_3$ using a model in which an $Fe^{3+}$ ion is surrounded by six $O^{2-}$ ligands whose charge distributions overlap the $Fe^{3+}$ ion. The application of our procedure to the model of overlapping ions leads to the important conclusion that the field gradients due to the various sources in the central cluster and the surrounding lattice are all subject to very different antishielding effects. The sources involved can be grouped broadly into three classes: local, nonlocal, and distant, with the local sources involving charge densities purely central in character, nonlocal sources involving charge densities composed of one central-ion orbital and one ligand-ion orbital, and the distant sources involving two categories, a distant electronic one composed of charge densities from purely ligand-ion orbitals, and a distant nuclear one, comprising the nuclear charges on the ligand ions ($O^{2-}$).

2789 **Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$.** Radousky, H.B.; Aldred, A.T.; Knapp, G.S.; Kouvel, J.S. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2859-2862(1 Sep 1983).

Measurements of the upper critical fields versus temperature in Y/sub 1-x/Er/sub x/$Rh_4B_4$ reveal that the system undergoes a nearly abrupt change from very weak to very strong pair breaking in an applied field with increasing Er concentration. This abrupt change in behavior occurs for $0.10<x<0.17$, and can be characterized by the relative variation of the magnetic correlation length $\xi$/sub M/ to the superconducting coherence length $\xi$/sub so/, which are the relevant length scales for this problem.

2790 **Chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films.** McLean, W. (Lawrence Livermore National Lab., CA); Colmenares, C.A.; Smith, R.L.; Somorjai, G.A. *Journal of Physical Chemistry;* **87**: No. 5, 788-793(3 Mar 1983). Contract W-7405-ENG-48.

The chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films has been studied by X-ray photoelectron spectroscopy (XPS). At pressures of $\sim 10^{-5}$ Pa both gases were found to adsorb without dissociating at room temperature. The $ThO_2$ films were prepared by drying and calcining a $Th(NO_3)_4$-$ThO_2$ slurry which was painted onto a gold substrate. Films prepared in this manner were mechanically and chemically stable, and were characterized by Auger electron spectroscopy (AES), X-ray photoelectron spectrosocpy (XPS), X-ray diffraction, and scanning electron microscopy (SEM). The calculated atomic sensitivity factor (ASF) for the $Th(4f_{7/2})$ photoelectron peak (6.7) is in relatively good agreement with the value recently reported in the literature (7.8).

2791 **Electronic structure of metal hydrides. VI. Photoemission studies and band theory of VH, NbH, and TaH.** Peterman, D.J.; Misemer, D.K.; Weaver, J.H.; Peterson, D.T. (Synchrotron Radiation Center, University of Wisconsin—Madison, Stoughton, Wisconsin 53589). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 799-807(15 Jan 1983).

The electronic structures of VH/sub x/, NbH/sub x/, and TaH/sub x/ ($0.6<$ or $=x<$ or $=1.0$) have been studied with the use of photoemission spectroscopy with synchrotron radiation ($10<$ or $=h\nu<$ or $=100$ eV). Two hydrogen-derived features are observed at ~5.5- and 7.5-eV binding energies, and the metal d bands are shown to be modified by the hydrogen interaction. These results show no agreement with rigid-band models based on the density of states of the pure metals and relatively poor agreement with previous band-structure calculations for monohydrides. We have calculated the energy bands of $\gamma$-phase NbH (self-consistently) and of $NbH_0$ and $NbH_2$ (non-self-consistently). Together, the calculations and experiments show how the metal-hydrogen interaction alters the electronic properties of the bcc metals.

2792 **Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures.** Chen, Y.; Gonzalez, R.; Schow, O.E.; Summers, G.P. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 1276-1282(15 Jan 1983). Contract W-7405-ENG-26.

Optical-absorption measurements show that $H^-$ ions are thermally much more stable than anion vacancies when thermochemically reduced MgO samples are annealed in a reducing atmosphere. At 1900 K all anion vacancies are annihilated, but the concentration of $H^-$ ions remains unchanged. Results of electron irradiations on a crystal annealed at 1900 K demonstrate unambiguously that the infrared absorption peaks previously attributed to $H^-$ ions are indeed due to protons in anion sublattice sites. $H^-$ concentrations can be obtained from the infrared absorbance of the $H^-$ ions. The lifetime of the 2.3-eV F-center phosphorescence is shown to be affected by the relative concentrations of $H^-$ ions to anion vacancy. Decreasing the anion-vacancy concentration by thermal annealing, thereby increasing the relative concentration of $H^-$ ions to anion vacancies, leads to an enhancement of the lifetime of the phosphorescence.

2793 **Luminescence from oxygen vacancies in MgO crystals thermochemically reduced at high temperatures.** Summers, G.P.; Wilson, T.M.; Jeffries, B.T.; Tohver, H.T.; Chen, Y.; Abraham, M.M. (Department of Physics, Oklahoma State University, Stillwater, Oklahoma 74078). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 1283-1291(15 Jan 1983). Contract W-7405-ENG-26.

Experimental measurements and theoretical calculations are reported which may resolve some of the remaining difficulties associated with photoemission from anion vacancies in thermochemically reduced MgO crystals. The intensities of the 2.3- and 3.2-eV luminescence bands are found to be strongly influenced by both the concentrations of $H^-$ ions and anion vacancies present, and also by the intensity of the ~5.0-eV exciting light. Theoretical calculations predict that for a $^1$A/sub 1g/ relaxation of the surrounding ions the $^1$T/sub 1u/ and $^3$T/sub 1u/ electronic states of the F center are almost degenerate and ~0.05 eV above the $^3$A/sub 1g/ state. The $^1$T/sub 1u/$\rightarrow$ $^1$A/sub 1g/ and the $^3$T/sub 1u/$\rightarrow$ $^1$A/sub 1g/ transition energies are predicted to be 2.2 and 2.9 eV, respectively.

2794 **Radiation damage in nuclear waste ceramics.** Turcotte, R.P.; Roberts, F.P.; Rusin, J.M.; Wald, J.W. (Pacific Northwest Laboratory, Richland, Washington 99352). *Journal of the American Ceramic Society;* **65**: No. 12, 589-593(Dec 1982). Contract AC06-76RL01830.

The text contains a number of specific observations about the radiation-induced changes in glass, glass-ceramic, and supercalcine nuclear waste forms. Other, more general conclusions can be summarized: Radiation-induced property changes follow an exponential ingrowth curve to saturation. Actinide host phases in both crystalline waste forms become X-ray amorphous. The magnitudes of the waste-form density changes observed could not be directly related to observed changes in the primary actinide phases. Although large crystal-structure changes occur in the materials studied, obvious physical degradation was not observed.

2795 **Influence of deposition parameters on laser-damage threshold of silica-tantala AR coatings.** Milam, D.; Lowdermilk, W.H.; Rainer, F.; Swain, J.E.; Carniglia, C.K.; Hart, T.T. (C. K. Carniglia and T. T. Hart are with Optical Coating Laboratory, Inc., P. O. Box 1599, Santa Rosa, California 95403; the other authors are with University of California, Lawrence Livermore National Laboratory, P.O. Box 5508, Livermore, California 94550.). *Applied Optics;* **21**: No. 20, 3689-3694(15 Oct 1982). Contract W-7405-ENG-48.

A series of 4-layer silica-tantala antireflection coatings was deposited under 18 different combinations of substrate temperature (175, 250, and 325 °C), oxygen pressure (0.5, 1.0, and 2.0 x $10^{-4}$ Torr), and rate of deposition (1.5 and 5 A/sec). Measurements of laser-damage threshold for 1064-nm, 1-nsec pulses, average absorption, net stress, and reflectivity were then made on these coatings. Coatings deposited at the lowest temperature had the highest damage thresholds. Damage thresholds were found not to be direct-

ly related to average absorption or net stress. Coatings deposited on fused silica substrates which had been polished by a bowl-feed process had generally higher damage thresholds than coatings deposited on conventionally polished fused silica or on BK-7 glass polished by either conventional or bowl-feed processes. Baking coatings in air for 4 h at 400 °C generally reduced average absorption and net stress, changed the net stress from compression to tension and, in some cases, increased the damage threshold.

2796 **Weak localization in indium oxide films.** Ovadyahu, Z. (Brookhaven National Lab., Upton, NY); Moehlecke, S.; Imry, Y. *Surface Science;* No. 113, 544-549(1982). Contract AC02-76CH00016.

We have observed anomalous transport properties in films of conducting indium oxide in both three and two dimensions. It is found that the interplay between d, l, and l/sub in/(T) (the film's thickness, elastic and inelastic mean-free-paths, respectively) determines the system's dimensionality and the nature of the transport properties. In a previous study it was shown that experimental results on 2D samples of this material are adequately accounted for by modern localization theories. This conclusion is now being extended to the 3D range as well. At the same time we find strong evidence for the relevance of electron-electron interaction in both 2D and 3D samples below ~100 K. In particlar, the 3D→2D crossover temperature as a function of d and the low-field negative magnetoresistance results agree quantitatively with a tau/sub in/ ~h/k/sub B/T law for the temperature variation of the inelastic relaxation time.

2797 **The influence of covalency on anion-anion interionic potentials in NiO.** Sabelli, N.H. (Univ. of Illinois at Chicago Circle); Benedek, R. *Solid State Communications;* **41**: No. 8, 589-591(1982).

Hartree-Fock self-consistent field cluster calculations were performed to investigate the short-range anion-anion interionic potential $V_{22}$ in NiO.The cluster consisted of two oxygen ions and ten surrounding Ni ions embedded in a matrix of point charges; the $Ni^{2+}$ ions were represented by pseudopotentials. $V_{22}$ was extracted from calculations of the total cluster electronic energy as a function of the O-O separation when one of the O ions is displaced from its lattice site towards the other O ion. The results indicate that covalency is mainly responsible for the anomalously large attractive terms in semiempirically derived O-O interionic potentials.

2798 **Investigation of the evaporation thermodynamics and stationary states (so-called "congruent states") in the study of oxides and their mixtures by the effusion method--application to $Al_2O_3$, CaO, and the mixtures $Al_2O_3$-CaO and $Ti_2O_3$-$TiO_2$.** Banon, S.; Chatillon, C.; Allibert, M. (Laboratoire de Thermodynamique et Physico-Chimie Metallurgiques, Saint Martin d'Heres, France). *High Temperature Science;* **15**: No. 2/3, 129-149(1982).

The congruent vaporization of oxides and oxide mixtures during Knudsen effusion has been studied, taking into account the nature of the equilibrium reactions between samples and crucible materials, the complexity of the resulting gaseous phases, and the possibility of an oxygen leak by diffusion through the crucible walls. The influence of the crucible reaction and of oxygen diffusion is estimated for pure CaO and $Al_2O_3$ and for the mixtures CaO + $Al_2O_3$ and $Ti_2O_3$ + $TiO_2$, in molybdenum cells. The results show a systematic shift of the effusion flow composition toward a reducing composition--either by crucible reaction or by establishment of a diffusion process. In the case of the $Ti_2O_3$-$TiO_2$ system, calculations of the expected congruent evaporation from JANAF standard pressures and our activity measurements indicate that the standard pressure of $TiO_2$ gas over solid $TiO_2$ must be increased by a factor of 4 to 14 to agree with the results from our studies of the congruent vaporization of solid $Ti_3O_5$. The congruent vaporization of liquid $Ti_2O_3$-$TiO_2$ mixtures occurs in the composition range $Ti_2O_3$-$Ti_3O_5$, an with inert crucible, a molybdenum crucible, or diffusion through the walls.

2799 **Study of the energy gap in single crystal $SmB_6$.** Molnar, S. von; Theis, T. (IBM Watson Research Center, Yorktown Heights, NY (USA)); Benoit, A.; Briggs, A.; Flouquet, J.; Ravex, J. (Centre National de la Recherche Scientifique, 38 - Grenoble (France). Centre de Recherches sur les Tres Basses Temperatures); Fisk, Z. (Los Alamos Scientific Lab., NM (USA)). pp 389-395 of Valence instabilities. Proceedings of the international conference held in Zurich, Switzerland, April 13-16, 1982. Wachter, P.; Boppart, H. (eds.) (Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik). Amsterdam, Netherlands; North-Holland (1982). (CONF-820454—).

From International conference on valence instabilities; Zurich, Switzerland (13 Apr 1982).

Includes author index.

The authors review the available experimental data which are consistent with a low energy gap in the electron excitation spectrum of $SmB_6$ and offer new evidence for such a gap in the form of low temperature specific heat and optical experiments.

2800 **Thermal diffusivities of molybdenum/alumina cermets.** Miller, H.C. (General Electric Co., St. Petersburg, FL). *Journal of the American Ceramic Society;* **64**: No. 10, C136-C138(Oct 1981). Contract AC04-76DP00656.

The thermal diffusivities of several molybdenum/alumina cermets were measured using a transient heat-flow, semi-infinite plate method. The cermets had thermal diffusivities significantly greater than those of 94% $Al_2O_3$ alumina. A 50/50 wt% cermet had a thermal diffusivity of 0.102 $cm^2/s$ at 313 K, while the alumina had a value of 0.067 $cm^2/s$.

2801 **Preparation of particulates for transmission electron microscopy: an update.** Lauf, R.J.; Rawlston, S.S. (Oak Ridge National Laboratory, TN). pp 132-133 of 39th annual proceedings of the electron microscopy society of America. Bailey, G.W. (ed.). Atlanta, GA; Electron Microscopy Society of America (1981). Contract W-7405-ENG-26.

A method for preparing fragmented or particulate ceramic materials for transmission electron microscopy (TEM) by embedding in a solid metal matrix such as aluminum, using vacuum hot-pressing at about 550ΩC, followed by mechanical thinning and ion milling, has been developed. This technique is useful for most high-melting ceramic materials but may introduce thermal damage to low-melting materials or to hydrated minerals. Two techiques that can be carried out at room temperature and that do not require vacuum hot pressing equipment are described. One method disperses the sample in a dental amalgam. The second method is used to prepare whole, pristine particles.

2802 **Microstructure of vanadium-oxygen alloys.** Lawless, K. (Univ. of Virginia, Charlottesville); Kenik, E.A.; Bentley, J. pp 84-85 of 39th annual proceedings of the electron microscopy society of America. Bailey, G.W. (ed.). Atlanta, GA; Electron Microscopy Society of America (1981). Contract AC05-76OR00033;W-7405-ENG-26.

The present study is a continuation of our investigation on in situ oxidation of vanadium and vanadium-titanium alloys. Vanadium is a reactive metal and forms a large number of oxides during high-temperature exposure to oxygen. The microstructure of the oxides formed during the first stages of oxidation and the transformations between oxide phases are under investigation.

2803 **Phase identification in $TiB_2Ni$ composites by analytical electron microscopy.** Sklad, P.S. (Oak Ridge National Lab., TN); Bentley, J.; Fisher, A.T.; Lehman, G.L. pp 138-139 of 39th annual proceedings of the electron microscopy society of America. Bailey, G.W. (ed.). Atlanta, GA; Electron Microscopy Society of America (1981). Contract W-7405-ENG-26.

The transition metal diboride $TiB_2$ is characterized by high hardness and high melting point (3253 K). These properties make this material attractive for applications such as valve components in coal liquefaction plants and cutting tools. Liquid phase hot pressing using nickel as the fluidizing medium allows densification at lower

temperatures than when using $TiB_2$ powders alone, but the nickel and $TiB_2$ react to form a complex multiphase microstructure. This investigation was to identify the nickel-binder phase. The material examined was taken from a cylindrical compact hot pressed at ~1720 K. During pressing most of the original 15 mol % Ni exuded from the initial mixtures. Specimens 3 mm dia were prepared for analytical electron microscopy (AEM) examination by mechanical lapping followed by ion milling.

2804 **Reflection and refraction imaging of oxide surfaces in TEM and STEM.** Turner, P.S.; Cowley, J.M. (Arizona State Univ., Tempe). *Scanning Electron Microscopy;* **1**: 390-391(1980). Contract AC02-76ER02995.

Refraction and reflection effects observed in a conventional TEM, from both MgO and NiO, together with further STEM observations are reported. The experimental techniques are straightforward and can provide information about surface roughness and variation in crystal structure close to the surface.

2805 **Stress-relaxation technique for deformation studies in four-point bend tests: application to polycrystalline ceramics at elevated temperatures.** Shetty, D.K.; Gordon, R.S. (Univ. of Utah, Salt Lake City). *Journal of Materials Science;* **14**: 2163-2171(1979). Contract AC02-76ER01591.

The advantages of the stress-relaxation technique can be effectively realized by applying the procedure to conventional four-point bend tests usually employed in the deformation studies of ceramic materials. A test system and procedure for determining plastic strain rate–stress relationships at elevated temperatures (up to 1600°C) by the stress-relaxation method is described. An analysis to calculate true plastic strains and stresses from measured deflections and loads is presented and it is shown that such an analysis requires minimum assumptions regarding the materials behaviour. Preliminary results obtained on an iron-doped MgO specimen are discussed and compared with the constant load test results obtained on identical specimens.Sources of error in the four-point bend stress-relaxation tests and the methods to minimize them are also discussed.

2806 **Effect of surface treatments on strength of PZT polycrystalline ceramics.** Biswas, D.R.; Fulrath, R.M. (Lawrence Berkeley Lab., CA). *Journal of Materials Science;* **14**: 2721-2725(1979). Contract W-7405-ENG-48.

In bending strength determinations of ceramics, the fracture usually initiates from the tensile surface or the edges. The edge effect could be minimized by carefully rounding off the edges of specimens subjected to four-point bending. The effect of tensile surface polishing, polishing and rounding off the edges, and the acid treatment of the polished surface on the strength of PZT polycrystalline ceramics was determined along with the failure mechanism.

## 3603 Composite Materials

2807 **(CONF-830104—6) Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers.** Tabaddor, F.; Clark, S.K. (Goodrich (B.F.) Co., Akron, OH (USA); Michigan Univ., Ann Arbor (USA). Dept. of Mechanical Engineering). 1983. Contract AC02-80ER10735. 9p. NTIS, PC A02/MF A01. Order Number DE84002371.

From International conference on constitutive laws for engineering materials: theory and application; Tucson, AZ, USA (10 Jan 1983).

Portions are illegible in microfiche products.

The definition of effective constitutive laws of advanced composites is re-examined and the theoretical limitations of such definition are discussed for Elastic and Viscoelastic Constitutive Laws of Cord Reinforced Rubber Composites. The theoretical models for calculating the viscoelastic energy loss characteristics of these composites are then discussed. These characteristics generally defy closed form solutions and hence are obtained numerically. The numerical procedures and numerical results are discussed and compared with data obtained from an extensive experimental program.

2808 **(CONF-8111188—1) Viscoelastic loss characteristics of cord rubber composites.** Tabaddor, F.; Clark, S.K. (Goodrich (B.F.) Co., Akron, OH (USA); Michigan Univ., Ann Arbor (USA)). 1981. Contract AC02-80ER10735. 17p. NTIS, PC A02/MF A01. Order Number DE84002368.

From 4. international conference on vehicle structural mechanics; Detroit, MI, USA (1 Nov 1981).

Portions are illegible in microfiche products.

Mechanical energy loss, in automobile tires, as well as other products made of cord reinforced rubber composites, is a major source of energy consumption. To minimize the energy loss, it is essential to increase the understanding of the way in which internal losses in a composite depend on the loss characteristics of the constituents used to fabricate it. In this paper, the application of the viscoelasticity theory in predicting the loss characteristics is discussed in detail. The scope and the limitations of the linear theory, the relations between the effective loss characteristics and constituents' properties, and the numerical methods for predicting the loss moduli are discussed. Some numerical results are presented.

2809 **Low-temperature dielectric constant of near-stoichiometric Na $\beta$-alumina.** Dobbs, J.N.; Anderson, A.C.; Hayes, W. (Department of Physics and Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3559-3560(15 Sep 1983). Contract AC02-76ER01198.

Measurements of the dielectric constant of Na $\beta$-alumina at temperatures below 2 K reveal that the density of low-energy excitations is not a function of the Na stoichiometric excess for the range 7—35 % excess Na.

2810 **Preliminary electron microscopic study of thermal-shock-resistant ceramic-metal composites.** Lauf, R.J.; Morgan, C.S. (Oak Ridge National Lab., TN). pp 140 of 39th annual proceedings of the electron microscopy society of America. Bailey, G.W. (ed.). Atlanta, GA; Electron Microscopy Society of America (1981). Contract W-7405-ENG-26.

Ceramic-metal composites, or cermets, are used for a variety of applications. In general, the ceramic phase provides hardness or wear resistance while a continuous metal phase acts as a binder and provides toughness. The alumina-based cermets described here are unique in that the metallic phase (platinum) is discontinuous and constitutes only about 1 to 2 vol % of the structure. This material was developed to serve as a high-temperature electrical insulator under conditions of severe thermal shock. Because of the small grain sizes involved, electron microscopy was used to study the relation between properties and process variables as well as to better understand the mechanism of thermal shock resistance.

2811 **Preparation of high-temperature oxide-metal eutectic composites: a review.** Holder, J.D.; Clark, G.W. (Oak Ridge National Lab., TN). *TMS (The Metallurgical Society) Paper Selection;* 225-239(1979). Contract W-7405-ENG-26.

From 108th AIME Annual Meeting; New Orleans, LA, USA (20 Feb 1979).

Internal zone growth (IZG) and skull melting continue to be the most promising techniques for the synthesis of oxide-metal eutectic composites. Radio-frequency heating instabilities, and relationships between sample size, coupling frequency, melting point, and electrical conductivity have been mathematically described for IZG by Hartzell and Sekerka. Their analysis has provided the basic understanding necessary to choose conditions for the critical parameters which allow the growth of 5-cm diameter oxide-metal eutectic composite bodies. A technique for tailoring the electrical conductivity of the starting compact is described which allows rf-coupling at room temperature without loss of sufficient heating efficiency to pass a melt zone through the sample. It is demonstrated that directional solidification theories applicable to growth in metallic systems apply equally as well to oxide-metal eutectic growth.

**2812 Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications.** Newkirk, L.R.; Riley, R.E.; Valencia, F.A.; Wallace, T.C. Sr. (Los Alamos Scientific Lab., NM). pp 82-101 of Chemically vapor deposited coatings. Washington, DC; The American Ceramic Society, Inc. ([nd]).

Various approaches to the preparation by CVD of carbon-filament-reinforced ceramic and metal matrix composites are discussed, including the coating of yarn, woven fabric, and three-dimensional preforms. The effect on tensile strength of Ta infiltration and subsequent reaction to TaC is examined in detail for several yarns, and the deposition of Ta and TaC on woven fabrics is discussed. Conditions for infiltrating fabric with $TiB_2$ and boron carbide are considered, along with some of the properties of hot-pressed composites formed from multiple layers of coated fabric. Infiltration of 3-D preforms by silicon carbide and boron carbide has been attempted with flexure strengths and the results of high temperature oxidation tests presented. Infiltration by Ta of a woven 3-D plug is also discussed.

## 3604 Polymers And Plastics

*REFER ALSO TO CITATION(S) 2960, 3151*

**2813 (INIS-mf—7727, pp 46-51) Ferroelectricity of polymers.** Fukada, E. (Institute of Physical and Chemical Research, Wako, Saitama (Japan)). Oct 1980. NTIS (US Sales Only), PC A16/MF A01. (CONF-8010267—).

From 2. Japan-Brasil symposium on science and technology; Rio de Janeiro, Brazil (13 Oct 1980).

A brief review is made of the ferroelectric properties observed in polyvinylidene fluoride (PVDF) and its copolymers.

**2814 Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks.** Mark, J.E.; Curro, J.G. (Department of Chemistry and the Polymer Research Center, University of Cincinnati, Cincinnati, Ohio 45221). *Journal of Chemical Physics;* **79**: No. 11, 5705-5709(1 Dec 1983).

The present theoretical approach to rubberlike elasticity is novel in that it utilizes the wealth of information which rotational isomeric state theory provides on the spatial configurations of chain molecules. Specifically, Monte Carlo calculations based on the rotational isomeric state approximation are used to simulate spatial configurations, and thus distribution functions for the end-to-end separation r of the chains. Results are presented for polyethylene (PE) [$CH^-_2$] and polydimethylsiloxane (PDMS) [$Si(CH_3)_2$—O—] chains most of which are quite short, in order to elucidate non-Gaussian effects due to limited chain extensibility. Large values of r were found to be more prevalent in PDMS than in PE, primarily because of the unusually large Si—O—Si bond angle in the PDMS chain, which increases its spatial extension. The use of these distribution functions in place of the Gaussian function for network chains gives upturns in modulus at high elongations, because of the rapidly diminishing number of configurations consistent with the required large values of r, and thus, correspondingly large decreases in the entropy of the network chains. Networks of PDMS should have values of the non-Gaussian increases in modulus significantly different from those for (amorphous) PE networks having the same number of skeletal bonds and stretched to the same relative length.

**2815 Irreversible random and cooperative processes on lattices: Exact and approximate hierarchy truncation and solution.** Evans, J.W.; Burgess, D.R.; Hoffman, D.K. (Ames Laboratory and Department of Chemistry, Iowa State University, Ames, Iowa 50010). *Journal of Chemical Physics;* **79**: No. 10, 5011-5022(15 Nov 1983).

Hierarchial rate equations are presented for processes where events occur irreversibly and, in general, cooperatively "filling" the sites of a lattice (the hierarchy is infinite for an infinite lattice). We comment on the hierarchial connectivity structure and a shielding property of empty sites. Hierachy truncation techniques are developed based on these. We consider, in detail, two irreversible processes on infinite, uniform lattices with nearest neighbor cooperative effects, modeling: (i) reaction at the sites of a 1D polymer chain; and (ii) chemisorption onto the sites of a 2D square lattice. Our truncation procedure recovers previously obtained exact results for the 1D case and provides approximate results for the 2D case. These are compared in various cooperativity regimes including highly autoinhibitory rates (filling in stages) and autocatalytic rates (island formation).

**2816 Irreversible reaction on a polymer chain with range two cooperative effects.** Evans, J.W.; Burgess, D.R. (Ames Laboratory and Department of Chemistry, Iowa State University, Ames, Iowa 50010). *Journal of Chemical Physics;* **79**: No. 10, 5023-5028(15 Nov 1983).

We consider the kinetics of an irreversible reaction at the sites of an infinite, uniform, 1D polymer chain with first and second nearest neighbor (nn) cooperative effects. The special cases with just nn cooperative effects, and with nn blocking and general second nn cooperative effects have previously been solved exactly. For the latter case, we present several new results for highly autoinhibitory and autocatalytic rates. The general problem cannot be solved exactly but we apply the techniques of the preceding paper, which for this process exploit a shielding property of quadruples of unreacted sites, to obtain approximate solutions. Various cooperativity regimes are considered.

**2817 $^{13}C$ spin diffusion of adamantane.** Bronniman, C.E.; Szeverenyi, N.M.; Maciel, G.E. (Department of Chemistry, Colorado State University, Fort Collins, Colorado 80523). *Journal of Chemical Physics;* **79**: No. 8, 3694-3700(15 Oct 1983).

Two-dimensional exchange spectroscopy of natural abundance $^{13}C$—$^{13}C$ spin diffusion in solid adamantane illustrates the influence that $^{13}C$—$^{1}H$ dipole—dipole coupling exerts on $^{13}C$ spin diffusion by determining spectral overlap in the $^{13}C$ system. 2D $^{13}C$ spectra were obtained for several values of mixing time tau/sub m/ and compared with spectra calculated in the limit of nearest-neighbor coupling. Good agreement is obtained for short tau/sub m/, during which the equilibration of neighboring spins dominates. For longer tau/sub m/, slower spin diffusion that is not acounted for by the simple model is seen; after nearest-neighbor spins equilibrate, communication over larger distances produces further mixing. It is possible to modify spin diffusion rates by altering experimental conditions, e.g., magic-angle spinning, low-power $^{1}H$ decoupling, or spin locking $^{13}C$ in the rotating frame during tau/sub m/.

**2818 Time-domain analysis of EPR measurements of polyacetylene and soliton diffusion.** Tang, J.; Lin, C.P.; Bowman, M.K.; Norris, J.R.; Isoya, J.; Shirakawa, H. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] B: Condensed Matter;* **28**: No. 5, 2845-2847(1 Sep 1983). Contract W-31-109-ENG-38.

A novel analysis of EPR measurements on polyacetylene is demonstrated by the analysis of the conventional line shape in time domain. Quantitative results of the hyperfine-coupling constant, the on-chain diffusion rate, and the off-chain hopping rate were extracted by nonlinear curve fitting to the time-domain signals, and they are consistent with the soliton model of polyacetylene.

**2819 Role of monovalent anions in organic superconductors.** Williams, J.M.; Beno, M.A.; Sullivan, J.C.; Banovetz, L.M.; Braam, J.M.; Blackman, G.S.; Carlson, C.D.; Greer, D.L.; Loesing, D.M.; Carneiro, K. (Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439). *Physical Review [Section] B: Condensed Matter;* **28**: No. 5, 2873-2876(1 Sep 1983). Contract W-31-109-ENG-38.

From an analysis of the crystallographic structures of 13 $(TMTSF)_2X$ salts (TMTSF, tetramethyltetraselenafulvalene and X, monovalent anion), at ambient temperature and 125 K, we demonstrate that the interchain Se-Se contacts correlate well with the observed physical properties of the salts. This is in contrast with earlier and less complete analyses which have focused on unit-cell dimensions or intrachain contacts.

## 3606 Other Materials

*REFER ALSO TO CITATION(S) 1796, 1993, 2039, 2039, 2088, 2089, 2100, 2120, 2121, 2248, 2248, 2249, 2587, 2747, 2930, 2930, 2987, 3103, 3142, 3209, 3213, 3214, 4165, 4166*

2820 **(CEA-CONF—6580) Wigner effect in graphite stack: G2 and G3 reactors.** Artozoul, M.; L'Homme, M. (Compagnie Generale des Matieres Nucleaires (COGEMA), Centre de Marcoule, 30 - Bagnols-sur-Ceze (France); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Nov 1982. 33p. (In French). (CONF-8211108—1). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703775.

From International conference on gas reactors; Bristol, UK (15 Nov 1982).

This text describes work carried out between 1978 and 1980 by a COGEMA/CEA team responsible for a report on the feasibility, effectiveness and possible hazards likely to be encountered in the nuclear annealing of G2 and in changing the operating conditions of G3.

2821 **(CEA-R—5209) Irradiation of layered metallic dichalcogenides: disorder in the charge density waves.** Mutka, H. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France); Paris-11 Univ., 91 - Orsay (France)). 1983. 113p. (In French). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704309.

This thesis is an experimental study on electron-irradiated metallic layer compounds ($VSe_2$, $NbSe_2$, $TaS_2$, $TaSe_2$). The metal atoms displaced by irradiation remain in the form of stable defects up to 300 K; their concentration ($10^{-5}$... $10^{-2}$)is known from measurements of displacement threshold energy and magnetic susceptibility. The effect of these defects on the charge density wave (CDW) phases and on the electronic and superconducting properties forms the major part of this study. In 1T-$TaS_2$, a microstructure of CDW domains pinned to defects is observed by electron microscopy. The effects of this kind of disorder are also manifest in the thermodynamic properties of the CDW and in the electronic transport, as well as in the superconducting properties.

2822 **(EFI—528(15)-82) Fine structure in the orientational dependence of the total yield of superfast electrons from a diamond crystal.** Avakyan, R.O.; Armaganyan, A.A.; Arutyunyan, L.G.; Taroyan, S.P. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703985.

The experimental results are presented on the investigation of orientational dependence of 4.7 GeV electron emission integral intensity in a diamond crystal. At small inlet angles of electrons with respect to the crystallographic axis 001 a fine structure is observed which is not accounted for by coherent bremsstrahlung theory.

2823 (INIS-BR—79, pp 5-15) **Physical adsorption and molecular dynamics.** Cohan, N.V. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Dept. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Some aspects of noble gases adsorption (except He) on graphite substrates are reviewed. Experimental results from this adsorption are analyzed and compared with molecular dynamics calculations.

2824 (INIS-BR—79, pp 151) **Study of krypton and xenon solid monoshells adsorbed in graphite by transmission electron diffraction.** Schabes-Retchkiman, P.S. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2825 (INIS-BR—79, pp 155) **Angular distribution of desorpted atoms of solid surfaces.** Romero, I.; Reyes, J. (Universidad Autonoma de Puebla (Mexico). Inst. de Ciencias). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2826 (INIS-BR—79, pp 193) **Optical properties of quasi-two-dimensional systems.** Mochan, L.; Barrera, R.G. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2827 (INIS-BR—79, pp 225) **Studies in the CdS/$Cu_2S$ heterojunction.** Souza, P.G. de (Universidade Estadual de Campinas (Brazil)). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

2828 **(JAERI-M—82-146) Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$.** Ohno, Hideo; Konishi, Satoshi; Noda, Kenji; Takeshita, Hidefumi; Katsuta, Hiroji; Yoshida, Hiroshi; Watanabe, Hitoshi; Matsuo, Tooru. (Japan Atomic Energy Research Inst., Tokyo). Oct 1982. 37p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700011.

Tritium (hydrogen) behavior in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$ has been clarified to have close relation with the diffusion of $Li^+$ ion by the analysis of nuclear magnetic resonance and ionic conductivity. The activation energy of diffusion coefficients of tritium, deuterium or hydrogen in $Li_2O$ above 500°C coincide with those of ionic conductivity in extrinsic region and dipole-dipole interaction with $Li^+$ ion diffusion in nuclear magnetic resonance. The same results were obtained in $Li_2SiO_3$ and $LiAlO_2$. The ionic conductivities of $Li_2O$ depend largely on the concentration of $OH^-$ impurity in the sample. The conductivities of $Li_2O$ in a wet environment increase dramatically between 400°C and 500°C and suggest that the increase is associated with the melting of LiOH within the material on exposure to moisture. The transition temperature between extrinsic and intrinsic region increase as increasing the amount of LiOH concentration in the sample.

2829 **(JINR—R-17-82-868) Some specific features of coherent radiation and particle propagation in crystals.** Adam, G.; Adam, S.; Gavrilenko, G.M.; Mikhalake, D.; Fedyanin, V.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 8p. (In Russian). (CONF-8210181—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703989.

From 2. All Union school on the particle-crystal interaction physics; Tashkent, USSR (1 Oct 1982).

Scattering of the high energy particles channeled through crystals on the lattice phonons is reviewed and has proved to play an important role at large penetration depths. Then the occurence of two distinct peaks is shown to be predicted by the theory for the radiation spectrum emitted by positrons channeled along special planes in binary crystals. Finally, free of fit parameters, theoretical results are reported for the spectral density of the radiation emitted in the forward direction by 5 GeV and 10 GeV positrons channeled along (110) planes in Si. A comparison between the recent experimental data and other works is performed.

2830 (KIYI—81-24, pp 44-46) **Raman scattering study of $HgI_2$ crystal structure perfection.** Gajsler, V.A.; Zaletin, V.M.; Kravchenko, A.F.; Terekhov, A.S. 1981. (In Russian). NTIS (US Sales Only), PC A04/MF A01.

In Ways of improving semiconductor detectors.

For investigating the perfection of crystal structure the $HgI_2$ Raman scattering spectra obtained by different methods (from a solution of analytically pure powder in acetone with recrystallization in hydrochloric acid and without it, from a gaseous phase by static method, from a gaseous phase with iodine supersaturation) are studied. The Raman scattering has been excited by the light of a He-Ne laser with the wave length, lambda=638.8 nm. On the basis of experimental data presented one can draw a conclusion that $HgI_2$ perfect crystals are obtained when grown from a gaseous phase, with iodine supersaturation.

**2831 (N—8327879) Experiments with phase transitions at very high pressure. Final Report.** Spain, I.L. (Colorado State Univ., Fort Collins (USA)). Jun 1983. 30p. (NASA-CR—3696; E—1513). NTIS, PC A03/MF A01.

Diamond cells were constructed for use to 1 Mbar. A refrigerator for cooling diamond cells was adapted for studies between 15 and 300 K. A cryostat for superconductivity studies between 1.5 to 300 K was constructed. Optical equipment was constructed for fluorescence, transmission, and reflectance studies. X-ray equipment was adapted for use with diamond cells. Experimental techniques were developed for X-ray diffraction studies using synchrotron radiation. AC susceptibility techniques were developed for detecting superconducting transitions. The following materials were studied: compressed solidified gases (Xe, Ar), semiconductors (Ge, Si, GaAs), superconductors ($Nb_3Ge$, $Nb_3Si$, $Nb_3As$, CuCl), molecular crystals (I).

**2832 (OEFZS—4218) Flash lamp annealing of ion implanted boron profiles.** Wieser, E.; Syhre, H.; Ruedenauer, F.G.; Steiger, W. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). May 1983. 17p. (In German). (PH—369/83). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703746.

The diffusion behaviour of ion implanted boron profiles (5x10E15 B/cm², 50keV) in silicon at 800 °C and 900 °C has been compared for samples with and without foregoing flash - lamp annealing of the radiation damage. The observed differences are discussed with respect to mechanisms of diffusion inhibition in the high concentration region.

**2833 (SAND—83-0930C) Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate.** Brannon, P.J.; Morris, R.W.; Asay, J.R. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-830719—55). NTIS, PC A02/MF A01. Order Number DE84002539.

From American Physical Society meeting on shock waves in condensed media; Santa Fe, NM, USA (18 Jul 1983).

The spectral and spatial properties of shock-induced luminescence from X-cut quartz and Z-cut lithium niobate are observed using optical pyrometry and fast framing photography. In both cases the spatial emission patterns are heterogeneous for stresses just above dynamic yielding; the pattern becomes homogeneous to within the spatial resolution of the experiment as the stress is increased further. In addition, the luminescence in both cases increases abruptly after dynamic yielding. The emission spectrum from both samples is bank-like rather than blackbody and in the case of X-cut quartz is similar to the photoluminescence from structural defects.

**2834 (SAND—83-1418C) Effects of light and modulation frequency on spin-dependent trapping at silicon grain boundaries.** Lenahan, P.M.; Schubert, W.K. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 10p. (CONF-831174—9). NTIS, PC A02/MF A01. Order Number DE84002107.

From Materials Research Society annual meeting; Boston, MA, USA (14 Nov 1983).

The effects of measurement frequency and illumination on spin-dependent trapping at trivalent silicon centers in a silicon grain boundary have been studied. Measurement frequency effects are quantitatively understood in terms of an electronic relaxation time for the traps. Illumination results suggest most of the trivalent silicon centers in the grain boundary are in a negatively charged, diamagnetic state.

**2835 (SAND—83-2276C) Modification of point defects in quartz for device applications.** King, J.C.; Koehler, D.R. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 12p. (CONF-831174—10). NTIS, PC A02/MF A01. Order Number DE84002611.

From Materials Research Society annual meeting; Boston, MA, USA (14 Nov 1983).

Impurity centers in quartz play a significant role in the behavior of precision crystal resonators subjected to ionizing radiation. The substitutional Al center, charge compensated by Na, Li, H or a hole, is now known to be the primary contributing factor in most radiation-induced effects. Acoustic loss measurements, ESR measurements, optical studies and IR Studies of these defects, over extended temperature ranges, have contributed substantially to our understanding of the impurity centers' role. Radiation-induced frequency and acoustic loss changes in terms of the evolving character of the defect center in a radiation field, and such understanding has prompted material improvement efforts such as high temperature electrolysis.

**2836 Strain measurements by channeling angular scans.** Picraux, S.T.; Dawson, L.R.; Osbourn, G.C.; Biefeld, R.M.; Chu, W.K. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **43**: No. 11, 1020-1022(1 Dec 1983). Contract AC04-76DP00789.

We demonstrate the first direct measurement of strain in In/sub x/Ga/sub 1-x/As/GaAs strained-layer superlattices by ion channeling angular scans. This technique permits quantitative measurement of the strain without requiring computer simulations of dechanneling. The measurements are generally applicable to the study of strain in heteroepitaxial layers.

**2837 Substrate temperature dependence of microcrystallinity in plasma-deposited, boron-doped hydrogenated silicon alloys.** Rajeswaran, G.; Kampas, F.J.; Vanier, P.E.; Sabatini, R.L.; Tafto, J. (Division of Metallurgy and Materials Science, Brookhaven National Laboratory, Upton, New York 11973). *Applied Physics Letters;* **43**: No. 11, 1045-1047(1 Dec 1983). Contract AC02-76CH00016.

The glow-discharge decomposition of silane diluted in hydrogen using diborane as a dopant results in the deposition of p-type microcrystalline silicon films at relatively low temperatures. The conductivity of these films is critically dependent on the substrate temperature when the ratio of silane flow rate to total gas flow rate is 1%. Electron micrographs show that highly conducting films contain numerous clusters of 2.5-nm crystallites that are embedded in an amorphous medium.

**2838 Quasifree electron mobility by the method of partial waves in liquid hydrocarbons and in fluid argon.** Vertes, A. (Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana 46556). *Journal of Chemical Physics;* **79**: No. 11, 5558-5562(1 Dec 1983).

Applicability of the fluctuation model was tested in the case of n-hexane, n-pentane, c-hexane, 2,2-dimethylbutane, 2,2,4,4-tetramethylpentane, iso-octane, and neopentane. In our model, the quasifree electrons have been assumed to be scattered by the conduction state energy fluctuations of the liquid. These fluctuations are, in turn, described as a consequence of density fluctuations. The scattering potential is supposed to be square well like and the cross section is calculated in terms of partial waves. Averages due to the density fluctuations and the electron kinetic energy distribution are determined numerically. Except for the first three materials, the calculation reproduced the experimental mobilities with reasonable values of the square well radius, which is the only fitting parameters. Further extension of the description concerning the density dependence of the low field mobility of fluid argon has been performed. The estimated fluctuation size as a function of density increases monotonically at the minimum of the mobility in accordance with the monotonic behavior of the isothermal compressibility in the same region.

2839 **Vibrational relaxation of $UF_6$: Ultrasonic measurements in mixtures with CO.** Bass, H.E.; Shields, F.D.; Breshears, W.D. (Physical Acoustics Research Group, The University of Mississippi, University, Mississippi 38677). *Journal of Chemical Physics;* **79**: No. 11, 5733-5734(1 Dec 1983).

Ultrasonic attenuation has been measured in mixtures of 5% and 10% $UF_6$ in CO at 273°K. The vibrational relaxation time of $UF_6$ by CO in the mixtures are computed and compared with those of $UF_6$-$N_2$ mixtures. (AIP)

2840 **Rapid thermal annealing of arsenic and boron-implanted silicon.** Narayan, J.; Holland, O.W.; Eby, R.E.; Wortman, J.J.; Ozguz, V.; Rozgonyi, G.A. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Applied Physics Letters;* **43**: No. 10, 957-959(15 Nov 1983). Contract W-7405-ENG-26.

Annealing of ion implantation damage and concomitant electrical activation of dopants, depth profiles, and lattice location of dopants have been studied in arsenic and boron-implanted specimens after rapid thermal annealing. A "complete" annealing of displacement damage with full electrical activation of dopants and profile broadening less than 100 A can be attained for shallow implants whereas some extended defects are retained for deep implants. Mechanisms of rapid thermal annealing and its implications in solid state device fabrication are discussed.

2841 **Impact ionization near GaAs grain boundaries.** Pike, G.E.; Gourley, P.L.; Kurtz, S.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **43**: No. 10, 939-941(15 Nov 1983). Contract AC04-76DP00789.

Electroluminescence from a GaAs bicrystal has been measured at high current densities, and gives direct evidence of impact ionization near the grain boundary. Negative differential capacitance is seen at lower current densities and is associated with barrier height modulation by minority carriers.

2842 **Ion channeling studies of InGaAs/GaAs strained-layer superlattices.** Picraux, S.T.; Dawson, L.R.; Osbourn, G.C.; Chu, W.K. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **43**: No. 10, 930-932(15 Nov 1983). Contract AC04-76DP00789.

The first ion channeling studies of the In/sub x/Ga/sub 1-x/As/GaAs strained-layer superlattice (SLS) system are reported. The strong orientation dependence of the dechanneling for both axial and planar directions relative to the [100] growth axis indicates that the roughly-equal 1% lattice mismatch is accommodated by lattice strain. Tetragonal distortions along the growth direction give rise to alternating tilts for inclined crystal directions which result in significant [110] and (110) dechanneling. Measurements for 40-layer structures with different in concentrations demonstrate that the channeling technique is a depth-sensitive probe of the degree of strain in SLS systems.

2843 **Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics.** Brawer, S. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Journal of Chemical Physics;* **79**: No. 9, 4539-4544(1 Nov 1983).

An ab initio calculation of the density of states, infrared absorption, Raman scattering, and inelastic neutron scattering of $BeF_2$ glass is reported and the calculated spectra compared with experiment. The model of the glass structure was obtained by molecular dynamics simulations. The spectra are obtained with no free parameters apart from an overall multiplicative constant. The force constants are obtained directly from the interaction potential used in the simulations. The shape of the spectra agree well with experiment but the frequencies of the band centers are 100—150 $cm^{-1}$ too small. The spectra differ appreciably from the density of states, particularly for the infrared absorption. The calculated results are the same for glasses of 120 and 390 ions. None of the modes are localized.

2844 **Extended x-ray absorption fine structure studies of diffused copper impurities in ZnSe.** Goldman, A.I.; Canova, E.; Kao, Y.H.; Fitzpatrick, B.J.; Bhargava, R.N.; Phillips, J.C. (Department of Physics, State University of New York at Stony Brook, Stony Brook, New York 11794). *Applied Physics Letters;* **43**: No. 9, 836-838(1 Nov 1983).

We have performed the first extended x-ray absorption fine structure investigation of the local environment around dilute copper impurities diffused into the II-VI semiconductor ZnSe. An average first nearest neighbor distance of 2.32 +- 0.06 A is obtained. Our results indicate a rather large distortion of the local environment surrounding the copper impurities and/or displacement of these impurity atoms from simple substitutional sites (Cu/sub Zn/) and high symmetry interstitial sites (Cu/sub I/).

2845 **Electron mobilities in In/sub 0.2/Ga/sub 0.8/As/GaAs strained-layer superlattices.** Fritz, I.J.; Dawson, L.R.; Zipperian, T.E. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **43**: No. 9, 846-848(1 Nov 1983). Contract AC04-76DP00789.

We report the first Hall effect and resistivity measurements on strained-layer superlattices (SLS's) in the (In,Ga)As system. The samples, grown by molecular beam epitaxy, had 60 periods of alternating, 120-A-thick In/sub 0.2/Ga/sub 0.8/ As and GaAs layers. Both uniform-doped and modulation-doped structures (with Si donors) were studied. Low-temperature mobilities of over 3 x $10^4$ $cm^2/Vs$ were obtained for structures with doping in only the central 30-A region of each GaAs layer. Our results are comparable to reported results on similar (Al,Ga)As superlattices, confirming that high crystalline quality can be obtained in SLS's with significant mismatch ($\sim$1.4%) and many interfaces ($>$100).

2846 **Strain-induced localization and electronically stimulated desorption and dissociation.** Jennison, D.R.; Emin, D. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review Letters;* **51**: No. 15, 1390-1393(10 Oct 1983). Contract AC04-76DP00789.

The small-polaron-like "self'trapping" of a surface electronic excitation plays a central role in electronically stimulated desorption. Two types of desorption, immediate and delayed, are possible. Calculations for hydrogen on silicon surfaces indicates that two-hole excitations produce immediate desorption for $H^+$ while single holes may produce delayed desorption of neutral H.

2847 **Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$.** Yoshizawa, H.; Shirane, G.; Shiba, H.; Hirakawa, K. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 7, 3904-3908(1 Oct 1983).

The magnetic behavior of $Cs_2CoCl_4$ is studied by quasielastic neutron scattering techniques. The one-dimensional (1D) character along the orthorhombic b axis is established by the observation of a sheetlike structure in the static correlation function S(Q). The temperature dependence of the inverse correlation length $\kappa \sim 0.88k$/sub B/T/'J' between 0.32 and 0.65 K is consistent with the recent theoretical calculation of the $\kappa$ for the in-plane component of spins in a 1D XY system with S = 1/2. In addition, the modulation of the 1D sheet of S(Q) was found in the paramagnetic phase. With a basis on a simplified model of competing interactions we show that the 1D short-range order is driven to an incommensurate state due to the interchain exchange interactions.

2848 **Linear and nonlinear intensity dependent refractive index of Hg/sub 1-x/Cd/sub x/Te.** Jensen, B.; Torabi, A. (Department of Physics, Boston University, Boston, Massachusetts 02215). *Journal of Applied Physics;* **54**: No. 10, 5945-5949(Oct 1983). Contract AC02-79ER10444.

The index of refraction n is calculated as a function of frequency and mole fraction x for the ternary compound Hg/sub 1-x/Cd/sub x/Te in terms of known experimental parameters and compared with recent experimental results. The theoretical result for n is obtained from a quantum mechanical calculation of the dielectric constant of a compound semiconductor, which has been successfully applied to a number of III—V and II—VI binary, ternary, and quaternary compounds for which experimental data are available.

The refractive index is calculated in terms of basic material parameters only, with no adjustable constants. These material parameters consist of band-gap energy, effective electron mass, and effective heavy hole mass at the band edge, the lattice constant, the spin-orbit splitting energy, and the carrier concentration for n-type of p-type materials. If these parameters are known as functions of mole fraction x and temperature, the refractive index is completely determined as a function of frequency below the fundamental absorption edge. The change in refractive index with increasing temperature depends mainly on the change in band-gap energy with temperature and is expected to be positive for $x>0.529$ and negative for $x<0.529$ for Hg/sub 1-x/Cd/sub x/Te . A negative change in the refractive index at the absorption edge proportional to I¹/sup //³, where I is the incident radiation intensity, is predicted on passing radiation through a crystal if the change in carrier concentration of the initially unoccupied conduction band is assumed proportional to I.

2849 **Effects of surface preparation on the properties of metal/CdTe junctions.** Werthen, J.G.; Haering, J.; Fahrenbruch, A.L.; Bube, R.H. (Department of Materials Science and Engineering, Stanford University, Stanford, California 94305). *Journal of Applied Physics;* **54**: No. 10, 5982-5989(Oct 1983).

The effects of surface preparation on the properties of single crystal CdTe junctions have been investigated through characterization of metal/CdTe junctions. Oriented surfaces include air-cleaved (110) surfaces, bromine-in-methanol etched (110) and (111) surfaces, and bromine-in-methanol etched surfaces subjected to a hydrogen heat treatment. Surface photovoltage measurements of the surfaces indicate larger band bending on the etched surfaces than on the cleaved and heat treated surfaces. X-ray photoelectron spectroscopy analysis verifies that excess Te remains after bromine-in-methanol etching and that cleaving leaves a stoichiometric surface. Hydrogen heat treatment of an etched CdTe surface restores a stoichiometric cleaved-like surface from that altered by the etching process. The barrier height for metal/CdTe junctions formed on cleaved surfaces depends on metal work function and reaches 0.99 V in an Al/CdTe junction and 0.87 V in a Cr/CdTe junction. Junctions formed with different metals on etched (110) surfaces result in barrier heights of 0.55—0.65 V with no dependence of the barrier height on the metal work function being observed, due to the presence of an etch-induced layer that partially governs the properties the surface. Heat treatment of an etched surface results in metal/CdTe junctions with characteristics similar to those of junctions formed on cleaved surfaces, and dependence of barrier height on metal work function is again observed, indicating the removal of an etch-induced layer by the heat treatment and the production of a junction similar to that on the cleaved surface.

2850 **Reactive sputtering of amorphous silicon in Ne, Ar, and Kr.** Ross, R.C.; Messier, R. (Materials Research Laboratory, The Pennsylvania State University, University Park, Pennsylvania 16802). *Journal of Applied Physics;* **54**: No. 10, 5744-5749(Oct 1983).

We have characterized hydrogenated amorphous silicon films prepared by rf diode sputtering in varying partial pressures of Ne, Ar, and Kr. The mechanisms of ion bombardment of growing film surface due to large negative floating potentials at low gas pressures can explain the observed film characteristics. These inert gas effects are in contrast to those seen in inert gas dilution studies of glow discharge decomposition of $SiH_4$. These differences are examined and lead to general conclusions about the effect of bombardment in minimizing microstructure, and in producing electronically-active defects. Other bombardment processes are also discussed.

2851 **Three holes bound to a double acceptor: $Be^+$ in germanium.** Haller, E.E.; McMurray, R.E. Jr.; Falicov, L.M.; Haegel, N.M.; Hansen, W.L. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 12, 1089-1091(19 Sep 1983). Contract AC03-76SF00098.

A double acceptor binding three holes has been observed for the first time with photoconductive far-infrared spectroscopy in beryllium-doped germanium single crystals. This new center, $Be^+$, has a hole binding energy of ~5 meV and is only present when free holes are generated by ionization of either neutral shallow acceptors or neutral Be double acceptors. The $Be^+$ center thermally ionizes above 4 K. It disappears at a uniaxial stress $>$ or $\approx 10^8$ dyn $cm^{-2}$ parallel to [111] as a result of the lifting of the valence-band degeneracy.

2852 **Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals.** Rowe, J.M.; Rush, J.J.; Susman, S. (National Measurement Laboratory, National Bureau of Standards, Washington, DC 20234). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3506-3511(15 Sep 1983).

The structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals for $x = 0.95$, 0.90, and 0.80 have been determined as a function of temperature. As the temperature is decreased from 295 K, where all of the samples are cubic (as are pure KCN and KBr), all samples measured transform to a monoclinic structure (space group Cc). For $x = 0.95$ and 0.90, at a lower temperature there is a further transition to an orthorhombic structure similar to that found for pure KCN below 168 K. However, the samples do not transform completely, and the monoclinic and orthorhombic structures coexist down to 6 K. More of the sample transforms for $x = 0.95$ than for $x = 0.90$. In both cases, that part of the sample which goes into the orthorhombic phase orders completely at the lowest temperatures, in a structure similar to that found for pure KCN at 6 K.

2853 **K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields.** Rosenberg, R.A.; LaRoe, P.R.; Rehn, V.; Stoehr, J.; Jaeger, R.; Parks, C.C. (Michelson Laboratories, Naval Weapons Center, China Lake, California 93555). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3026-3030(15 Sep 1983).

The yield of photoelectrons and photoions from condensed $H_2O$ and $D_2O$ ice near and above the oxygen K edge is reported. Results of studies in the near-edge region indicate that Rydberg excitations, which are quenched in the bulk, survive, to some extent, on the surface. Analysis of the extended x-ray absorption fine structure of the photoelectron yield above the edge yields an oxygen-oxygen scattering phase shift in good agreement with theory.

2854 **Structural properties of III-V zinc-blende semiconductors under pressure.** Froyen, S.; Cohen, M.L. (Department of Physics, University of California, Berkeley, California 94720 and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3258-3265(15 Sep 1983).

The pseudopotential method within the local-density approximation is used to investigate the static and structural properties of some III-V compound semiconductors. Comparisons of calculated total energies as a function of volume and structure yield information about solid-solid phase transformations. At high pressures the results indicate that several metallic structures are lower in energy than the zinc-blende structure. From our results the compounds (AlP, AlAs, GaP, and GaAs) can be divided into two classes. In the Ga compounds, we find a pressure-induced phase transformation to either rocksalt, $\beta$-Sn, or NiAs, whereas in the Al compounds rocksalt and NiAs are stabilized with respect to $\beta$-Sn. All structures except zinc blende are metallic. We discuss the electronic structure of each phase and show how it relates to structural stability.

2855 **Importance of temperature-dependent optical properties for Raman-temperature measurements for silicon.** Jellison, G.E. Jr.; Lowndes, D.H.; Wood, R.F. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3272-3276(15 Sep 1983).

A standard relation of Raman scattering in the resonant regime is that the Raman matrix element R is well represented by $K\, d\epsilon/dE$, where $\epsilon$ is the dielectric function, E is the photon energy, and K is a constant. However, the only experimental check of this relationship in silicon [Renucci et al., Phys. Rev. B 11, 3885 (1975)] concluded that it was only approximately valid. In this

paper it is shown for silicon in the resonant regime that the agreement between the measured values of the Raman matrix element squared, $\sigma = |R'|^2$ and $|K^2 d\epsilon/dE'|^2$, is very good indeed, if accurate values of the dielectric function are used. With the use of recently obtained temperature-dependent optical functions of silicon, the absorption coefficient, the Raman matrix element squared, the index of refraction, and the normal-incidence reflectivity are determined and shown to be strong functions of temperature in the resonant regime. The Stokes to anti-Stokes intensity ratio is calculated and found to compare favorably with values found in the literature for samples held at constant temperature. It is concluded that the temperature dependence of the optical properties must be included in any interpretation of measurements to determine the temperature from the Stokes to anti-Stokes intensity ratio.

2856 **Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor.** Kwak, J.F. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 6, 3277-3282(15 Sep 1983).

The Fermi surface of the organic superconductor $(TMTSF)_2PF_6$ (bis-tetramethyltetraselena- fulvalenium hexafluorophosphate) should be open in a one-electron picture. Magnetotransport results, on the other hand, indicate the presence in the metallic state of small closed and compensated orbits. Such orbits can arise if there is an instability of commensurate wave vectors nesting the Fermi surface. The areas calculated here for these orbits are shown to strongly favor nonoptimal nesting over optimal nesting (i.e., the optimal areas are far too small). A model of instability commensuration change at the observed threshold associated with the Shubnikov—de Haas effect, driven by the magnetic field dependence of the Landau-level energies for the optimal orbits, is seen to be consistent with the present results and with many of the novel properties of this material.

2857 **Surface effects on energies of Auger electrons from Xe(111).** Kaindl, G.; Chiang, T.; Mandel, T. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 6, 3612-3614(15 Sep 1983).

The Xe N/sub 4,5/O/sub 2,3/O/sub 2,3/ Auger spectrum of a Xe crystal grown on Pd(111) is found to consist of two atomiclike subspectra from surface and bulk Xe atoms, respectively, separated by Δ/sup A/ = 0.79 +- 0.05 eV. This surface Auger-electron shift is three times as large as the simultaneously studied surface shift of the Xe 4d core-level photoemission lines. We explain these surface shifts in terms of a reduced dielectric screening of the positive hole states in surface atoms as compared with the bulk.

2858 **Ion dechanneling due to lattice strains in semiconductor superlattices.** Barrett, J.H. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2328-2334(1 Sep 1983).

A new source has been considered for the unusual ion dechanneling found in InAs-GaSb superlattices. This new source stems from the strains that occur in the layers because of the slight mismatch between the lattice constants of the two materials. The strains cause the rows and planes of atoms in the crystal that are inclined to the surface normal to have small directional misalignments at the interfaces between the layers. The effects of these misalignments have been incorporated into computer simulations of ion trajectories in the crystal and have been shown by means of the simulations to account in a reasonable manner for the observed dechanneling behavior. Two ways of measuring the amount of misalignment are suggested as a result of the simulations. Calculations have also been done as a function of the amount of misalignment to give some indication of how much dechanneling might be expected for superlattices composed of other pairs of materials with different degrees of mismatch.

2859 **Closed-loop phase diagrams, vaporization, and multicriticality in binary liquid mixtures.** Caflisch, R.G.; Walker, J.S. (Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2535-2546(1 Sep 1983). Contract AC02-76CH00016.

The coupled Potts-Ising models of Walker and Vause, which successfully describe closed-loop phase diagrams in hydrogen-bonding mixtures, are generalized to encompass the vapor phase, and are studied using position-space renormalization-group techniques. Global phase diagrams are generated, exhibiting such features as miscibility-immiscibility criticality, liquid-vapor critical points, critical end points, and bicritical and tricritical points. In addition, new types of phase diagrams are found, involving upper and lower azeotropes, for example, which are expected to be physically realizable in experimental systems.

2860 **Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/$F_2$.** Hagen, M.; Cowley, R.A.; Satija, S.K.; Yoshizawa, H.; Shirane, G.; Birgeneau, R.J.; Guggenheim, H.J. (Department of Physics, University of Edinburgh, Mayfield Road, Edinburgh EH93JZ, Scotland, United Kingdom). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2602-2613(1 Sep 1983).

The phase transition and ordering of the d = 3 diluted Ising antiferromagnet Co/sub x/Zn/sub 1-x/$F_2$ has been studied using two-axis neutron diffraction for the cases (i) where x is close to the percolation threshold, in zero applied magnetic field, and (ii) as a function of applied magnetic field for samples with x = 0.26 and 0.35. The results of the percolation study show complicated behavior, probably due to concentration gradient problems. Nevertheless, there is strong evidence that the inverse correlation length decreases to zero at the onset of long-range order. The results of the magnetic field study are compared with the theoretical predictions for the d = 3 Ising model in a random field. It is found that when the samples are cooled in even the smallest (nonzero) fields the long-range magnetic order is destroyed and that the structure factor is well described by the Lorentzian plus Lorentzian squared form. The inverse correlation length is found to have a power-law dependence on the applied magnetic field at low temperature with exponents ν/sub H/ = 2.17 +- 0.3 for the x = 0.26 sample and ν/sub H/ = 3.63 +- 0.3 for the x = 0.35 sample. This result is not consistent with the current theoretical predictions for the field dependence of the inverse correlation length in the d = 3 Ising model in a random field. The measurements also show that the system is frozen at low temperatures and this freezing may be responsible for the discrepancy between theory and experiment.

2861 **Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$.** Vining, C.B.; Shelton, R.N. (Ames Laboratory and Department of Physics, Iowa State University, Ames, Iowa 50011). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2732-2742(1 Sep 1983). Contract W-7405-ENG-82.

The low-temperature heat capacity of antiferromagnetic ternary iron silicides $M_2Fe_3Si_5$ (M = Sm, Gd—Yb) has been measured from 0.5 to 30 K. Antiferromagnetic ordering temperatures range from 1.06 to 10 K for these materials including multiple magnetic transitions in $Sm_2Fe_3Si_5$, $Tb_2Fe_3Si_5$, and $Er_2Fe_3Si_5$. Magnetic ordering via the Ruderman-Kittel-Kasuya-Yosida interaction is indicated, even in the presence of large crystalline electric field effects. Entropy considerations indicate the magnetic ground state is a doublet in all of these materials except $Gd_2Fe_3Si_5$. Anomalous behavior is observed with respect to spin-wave and nuclear contributions to the total heat capacity, crystalline electric field effects, and critical behavior.

2862 **Efficient scheme for calculation of low-energy electron-diffraction intensities in the presence of large superlattices, with application to the structural analysis of benzene adsorbed on Rh(111).** Van Hove, M.A.; Lin, R.; Somorjai, G.A. (Materials and Molecular Research Division and Department of Chemistry, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 9, 778-781(29 Aug 1983). Contract AC03-76SF00098.

A powerful calculational low-energy electron-diffraction scheme is introduced for superlattices with unit cells of any size: beam-set neglect. It is applied in the first structural analysis from low-energy electron-diffraction intensities of a large molecule, benzene, adsorbed on a single-crystal metal surface, Rh(111). In a ( $_{13}^{21}$) lattice, benzene is found to lie flat on the surface, centered over hcp-type hollow sites. A planar, possibly distorted $C_6$ ring is found with Rh—C bond lengths of 2.35 +- 0.05 A.

2863 **Transition from adiabatic to sudden core-electron excitation: $N_2$ on Ni(100).** Stoehr, J.; Jaeger, R.; Rehr, J.J. (Corporate Research-Science Laboratories, Exxon Research and Engineering Company, Linden, New Jersey 07036). *Physical Review Letters;* **51**: No. 9, 821-824(29 Aug 1983).

The first systematic study of the energy dependence of a core-level shake-up feature is presented. In contrast to expectations the shake-up peak remains nearly unchanged in intensity down to ~15 eV above threshold. The early and abrupt turn-on of the multielectron satellite found experimentally is well explained by a theory which describes the transition from adiabatic to sudden core-level excitation by a simple exchange interaction picture.

2864 **Structure-factor phase information from two-beam electron diffraction.** Tafto, J. (Metallurgy and Materials Science Division, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters;* **51**: No. 8, 654-657(22 Aug 1983). Contract AC02-76CH00016.

The electron-induced characteristic x-ray emission from a noncentrosymmetric crystal shows a pronounced intensity difference when the Bragg condition is fulfilled for the G and -G reflections, respectively, along a polar direction. This two-beam effect is demonstrated for GaAs and InP, and is a direct method of obtaining information about the phase of a structure factor and determining the sense of a polar direction.

2865 **Structural origin of optical bowing in semiconductor alloys p.** Zunger, A.; Jaffe, J.E. (Solar Energy Research Institute, Golden, Colorado 80401). *Physical Review Letters;* **51**: No. 8, 662-665(22 Aug 1983).

The principle of conservation and transferability of chemical bonds explains the recent discovery by extended x-ray absorption fine-structure measurements of two unequal anion-cation bond lengths R/sub A/C and R/sub B/C in A/sub x/B/sub 1-x/C zinc-blende semiconductor alloys despite the close adherence of the lattice constant to the average value (Vegard rule). This bond alternation, manifested as a structural distortion to a local chalcopyrite coordination around the anions, explains also most of the observed optical bowing in semiconductor alloys.

2866 **Relationship between the electronic density of states and the superconducting critical temperature of disordered $V_3Si$.** Welch, D.O.; Pande, C.S.; Caton, R.; Viswanathan, R. (Brookhaven National Laboratory, Upton, New York). *Journal of Low Temperature Physics;* **52**: No. 3, 289-300(1 Aug 1983). Contract AC02-76CH00016.

The available data on the effect of neutron and $\alpha$-particle irradiation on the superconducting properties and the low-temperature specific heat capacity of single- and polycrystalline $V_3Si$ were analyzed in a unified manner. It was found that the electron-phonon renormalization parameter $\lambda$ does not vary simply proportionally to the bare density of electron states at the Fermi level as had been earlier conjectured by Dynes and Varma, nor does it vary in exactly the same manner as found by Fradin and Williamson to hold for a variety of vanadium-based A15 structure compounds and pseudobinary alloys. When the behavior of $V_3Si$ is compared with that of $Nb_3Sn$, $Nb_3Al$, and $Nb_3Ge$, it is seen that the response to disorder of parameters of importance in the superconductivity of these compounds does not follow any simple, universal behavior.

2867 **Apparatus for growing a dendritic web.** Duncan, C.S.; Mchugh, J.P.; Piotrowski, P.A.; Skutch, M.E. (to Dept. of Energy). US Patent 4,389,377. 21 Jun 1983. Filed date 10 Jul 1981. vp.

PAT-APPL-282334.

A melt system including a susceptor-crucible assembly having improved gradient control when melt replenishment is used during dendritic web growth. The improvement lies in the formation of a thermal barrier in the base of the receptor which is in the form of a vertical slot in the region of the susceptor underlying the crucible at the location of a compartmental separator dividing the crucible into a growth compartment and a melt replenishment compartment. The result achieved is a step change in temperature gradient in the melt thereby providing a more uniform temperature in the growth compartment from which the dendritic web is drawn.

2868 **Estimation of the band gap of $InPO_4$.** Wager, J.F.; Wilmsen, C.W.; Kazmerski, L.L. (Hughes Research Laboratories, Malibu, California 90265). *Applied Physics Letters;* **42**: No. 7, 589-591(1 Apr 1983).

The band gap of a thin layer of $InPO_4$ was estimated to be 4.5 eV using a novel approach employing ultraviolet photoelectron spectroscopy and electron energy loss spectroscopy. The technique measures the conduction-band minimum and valence-band maximum referenced to the In 4d core line energy. Since this technique is highly surface sensitive, it can be used to measure the band gap of a thin layer. This parameter is difficult to measure in such layers using conventional techniques.

2869 **Electron drift velocities in gas mixtures of He, $N_2$, and $CO_2$.** Cornell, M.C.; Littlewood, I.M.; Brooks, H.L.; Nygaard, K.J. (Department of Physics, University of Missouri-Rolla, Rolla, Missouri 65401). *Journal of Applied Physics;* **54**: No. 4, 1723-1724(Apr 1983).

An electron swarm experiment has been used to obtain electron drift velocities in the He:$CO_2$:$N_2$ mixtures 0:1:1, 3:1:2, and 3:1:1. The E/N range of 3 to 57 Td was studied with total gas pressure varied from 50 to 200 Torr. These particular mixtures have not been previously studied experimentally. Good agreement is observed between theoretical calculations and experimental data.

2870 **Dispersion of the refractive index of InP and ZnTe.** Jensen, B.; Torabi, A. (Department of Physics, Boston University, Boston, Massachusetts 02215). *Journal of Applied Physics;* **54**: No. 4, 2030-2035(Apr 1983). Contract AC02-79ER10444.

An analytical expression for the real part of the refractive index n near the fundamental absorption edge is given in terms of experimentally known quantities for a given semiconductor. It is derived from a quantum mechanical calculation of the complex dielectric constant which assumes the band structure of the Kane theory. The expression obtained is a function of the band-gap energy, the effective electron and heavy hole masses at the band edge, the spin orbit splitting energy, the carrier concentration for n- or p-type materials, the temperature, and the frequency of the incident radiation. Also involved is the value of n at the fundamental absorption edge, which is not accessible to measurement. However, an equation for n at the absorption edge can be found in terms of experimentally obtainable values of n near the absorption edge and solved to give the desired quantity. The refractive index can then be predicted to a high degree of accuracy over the entire frequency spectrum up to the band edge. In particular, the dispersion near the fundamental absorption edge which has been observed experimentally for a number of III-V and II-VI compounds is predicted and its precise calculation enabled. Within limits of the above statement regarding n at the absorption edge, there are no adjustable parameters involved. This constitutes a significant improvement over previous theories of the refractive index of a semiconductor, which typically involve several adjustable parameters. Theory is compared with available experimental results for InP and ZnTe. A method of determining the heavy hole effective mass from measurement of n in compounds where it is unknown is discussed.

2871 **Deposition and properties of zinc phosphide films.** Chu, T.L.; Chu, S.S.; Murthy, K.; Stokes, E.D.; Russell, P.E. (Southern Methodist University, Dallas, Texas 75275). *Journal of Applied Physics;* **54**: No. 4, 2063-2068(Apr 1983).

Thin films of zinc phosphide have been deposited on tungsten-coated steel substrates at 400—600 °C by the reaction of zinc and phosphine in a hydrogen atmosphere; tungsten was used as a barrier against the diffusion of iron from the substrate into zinc phosphide. By using a proper $PH_3$/Zn molar ratio, the deposited

films have been identified by electron microprobe and x-ray diffraction techniques to be $Zn_3P_2$. The electrical resistivity and photovoltage of unintentionally doped zinc phosphide films were measured as a function of the composition of the reaction mixture. The effective intragrain minority carrier diffusion length in nearly stoichiometric films was measured by the scanned beam method using a Schottky barrier structure. The incorporation of dopants into zinc phosphide films was also explored.

2872 **Rutherford backscattering evidence for solid phase laser annealing of Corning 7059 glass and ZnO thin films.** Dutta, S.; Jackson, H.E.; Boyd, J.T.; White, C.W. (Department of Physics, University of Cincinnati, Cincinnati, Ohio 45221). *Journal of Applied Physics;* **54**: No. 4, 2125-2126(Apr 1983). Contract W-7405-ENG-26.

Rutherford backscattering measurements have been made on ZnO and Corning 7059 glass optical waveguides before and after laser annealing to investigate whether melting is associated with the dramatic improvement in scattering loss which occurs after laser annealing. These measurements indicate that no redistribution of impurities takes place during annealing. We conclude that no melting occurs and that the annealing occurs in the solid phase.

2873 **Multiple-quantum NMR in solids.** Yen, Y.; Pines, A. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **78**: No. 6, 3579-3582(15 Mar 1983).

Multiple-quantum NMR has typically been observed in small groups of spins in isolated molecules. Due to the profusion of spin transitions in a solid, individual lines are unresolved. Excitation of high quantum transitions by normal schemes is thus difficult. To ensure that overlapping lines add constructively and to enhance sensitivity, time-reversal pulse sequences are used to generate all lines in phase. Up to 22-quantum $^1H$ absorption in solid adamantane is observed.

2874 **Time-resolved conductance and reflectance measurements of silicon during pulsed-laser annealing.** Galvin, G.J.; Thompson, M.O.; Mayer, J.W.; Peercy, P.S.; Hammond, R.B.; Paulter, N. (Department of Materials Science, Cornell University, Ithaca, New York 14853). *Physical Review [Section] B: Condensed Matter;* **27**: No. 2, 1079-1087(15 Jan 1983).

The dynamics of silicon solidification from the melt during pulsed-ruby-laser annealing have been investigated with the use of time-resolved electrical-conductance and optical-reflectance measurements. Melt duration was found to increase with laser-energy density to over 450 nsec at the highest energy used (3.1 J/cm$^2$). Resolidification velocity was found to vary with time and laser-energy density over a range of 2 to 3 m/sec. The melt threshold was observed to be 0.8 J/cm$^2$. Measurements of the laser energy absorbed in the sample were made to determine energy coupling parameters for use in numerical calculations. The numerical calculations, based on a thermal model for laser melting, are found to be in good agreement with the experimental results.

2875 **Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure.** Stout, N.D.; Piwinskii, A.J. (Lawrence Livermore National Lab., CA). *High Temperature Science;* **15**: No. 4, 275-292(Dec 1982). Contract W-7405-ENG-48.

We measured the enthalpy increments, H/sub T/-H/sub 298/, for liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$ over the temperature range 1700-2600 K. Experimental enthalpies for $CaSiO_3$ and $CaMgSi_2O_6$ are higher than estimates based on simple additivity by 15-20% at 2000 K. Heat capacities were independent of temperature. We calculated partial molal heat capacities for CaO and MgO liquids from the enthalpy data. We also measured the enthalpies of five polycomponent melts obtained by fusing various rocks collected from the Department of Energy Nevada Test Site; these were measured over the range 1520-2600 K. Two of these compositions showed a temperature trend in their heat capacities, indicating that models that assume temperature-independent partial molal heat capacities may be inadequate for estimating thermal properties of complex liquid silicates.

2876 **Effect of $\gamma$ radiation on high-water-content glasses.** Acocella, J.; Takata, M.; Tomozawa, M.; Warden, J.T.; Watson, E.B. (Rensselaer Polytechnic Institute, Troy, New York 12181). *Journal of the American Ceramic Society;* **65**: No. 9, 407-410(Sep 1982). Contract AC02-79ER10453.

$Na_2OX3SiO_2$ glasses containing up to ≈11 wt% water were prepared under high-pressure, hydrothermal conditions. The samples were exposed to gamma radiation of 5x10$^7$ rad. Optical and ESR measurements were made before and after exposure to radiation, and it was found that the induced absorption in the visible region decreased drastically with increasing $H_2O$ concentration. The induced ESR signal-integrated intensity also decreased with increasing water content. After irradiation an increase was observed in the fundamental OH absorption bands in the IR region of the spectra of the water-containing specimens.

2877 **Lattice dynamics of the intermediate valence compounds Sm/sub 0.75/Y/sub 0.25/S and TmSe.** Mook, H.A. (Oak Ridge National Lab., TN); Holtzberg, F. pp 113-119 of Valence fluctuations in solids. Falicov, L.M.; Hanke, W.; Maple, M.B. (eds.). Amsterdam, Netherlands; North-Holland Publishing Company (1981). Contract W-7405-ENG-26.

Neutron scattering techniques have been used to determine the phonon dispersion curves for Sm/sub 0.75/Y/sub 0.25/S and TmSe. Anomalies are found in the shape of the phonon dispersion curves and in the phonon widths that are attributable to mixed valence effects. Temperature dependent measurements for Sm/sub 0.75/Y/sub 0.25/S show that the greatest phonon softening and the largest phonon widths are found at the valence transition that occurs at about 200 K. Models for the lattice dynamics of mixed valence materials that take into account the coupling between the valence fluctuations and the lattice vibrations give good agreement with our data.

2878 **Melting and laser annealing in semiconductors using 0.485 $\mu$m and 0.193 $\mu$m pulsed lasers.** Narayan, J.; Fletcher, J.; Eby, R.E. (Oak Ridge National Lab., TN). pp 409-419 of Defects in semiconductors. Narayan, J.; Tan (eds.). Amsterdam, Netherlands; North-Holland, Inc. (1981). Contract W-7405-ENG-26.

Annealing of displacement damage, the dissolution of boron precipitates, the formation of constitution super-cooling cells, and the broadening of dopant profiles have been studied in laser annealed silicon. These samples were irradiated with a dye laser ($\lambda$ = 0.485 $\mu$m, tau = 9 ns, E = 0.7-1.2 J cm$^{-2}$) and an Excimer laser ($\lambda$ = 0.193 $\mu$m, tau = 9 ns, E = 0.5-0.7 J cm$^{-2}$) pulses. These results can be consistently interpreted by invoking melting during pulsed laser irradiated. Thus these results provide convincing evidence for the melting phenomenon.

2879 **Soft acoustic mode in thallium arsenic sulphide $Tl_3AsS_4$.** Fritz, I.J. (Sandia National Lab., Albuquerque, NM); Gotlieb, M.; Isaacs, T.J.; Morosin, B. *Journal of Physics and Chemistry of Solids;* **42**: 269-273(1981). Contract AC04-76DP00789.

Ultrasonic measurements of the slow shear mode velocity in $Tl_3AsS_4$ have been made as a function of hydrostatic pressure up to 2.6 GPa at room temperature. The velocity is a decreasing function of pressure over the entire pressure range. Two pressure-induced phase transitions are observed, one (at 2.1 GPa) characterized by a discontinuous drop in velocity, and the other (at 2.6 GPa) by a continuous softening of the velocity to zero. The results are discussed in terms of the Miller-Axe theory of internal-strain coupling to a soft optic mode. Comparison is made with results on $Tl_3PSe_4$, where only one transition is observed.

2880 **Laser processing of semiconductors.** Narayan, J. (Oak Ridge National Lab., TN). *TMS (The Metallurgical Society) Paper Selection;* 151-163(1981). Contract W-7405-ENG-26.

From 110th AIME Annual Meeting; Chicago, IL, USA (22 Feb 1981).

High-power laser pulses provide an ideal source of heat by which thin layers of semiconductors can be rapidly melted and sub-

sequently regrown with solidification rates of the order of several meters per second. Crystallized layers, under these rapid solidification conditions, were found to be remarkably defect-free. The details of rapid solidification are presented for binary silicon alloys, the alloying agent being one of the common dopants. Some of the applications of laser processing in device technology are illustrated.

2881 **Low-temperature thermal conductivity of porous Vycor.** Hsieh, T.C.; MacDonald, W.M.; Anderson, A.C. (Univ. of Illinois at Urbana-Champaign). *Journal of Non-Crystalline Solids;* **46**: 437-440(1981). Contract AC02-76ER01198.

Measurements of the low-temperature thermal conductivity, k, of glasses and of amorphous polymers have indicated that the phonon mean free path is strongly and explicitly frequency dependent at frequencies above $\approx 10^{11}$ Hz, and that this frequency dependence causes, between 1 and 10 K, the characteristic "plateau" (roughly temperature-independent regime) in k observed in amorphous materials. One test of this model was to apply it to the thermal conductivity of amorphous products containing holes of small diameter, $d < \lambda$. If indeed long-wavelength phonons were prevalent, diffractive scattering of phonons by the holes should be reduced. Vycor glass provides such holes and thus served as a test of the model.

2882 **Melting phenomenon and properties of defects associated with pulsed laser irradiation.** Narayan, J.; White, C.W. (Oak Ridge National Lab., TN). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* **43**: No. 6, 1515-1535(1981). Contract W-7405-ENG-26.

The phenomenon of melting produced by pulsed laser irradiation in silicon has been studied using electron microscopy. Removal of dopant precipitates, dislocations or loops provides clear evidence for melting. From the thickness of defect-free regions and the length of reoriented segments of dislocations, the depth of melting can be determined as a function of laser parameters. Using this technique, the depth of melting underneath the oxide layers has been investigated. Cellular structures observed in ion-implanted, laser-annealed specimens also provide convincing evidence of melting during pulsed laser irradiation.

2883 **Velocity and size dependences of the erosion rate in silicon.** Scattergood, R.O.; Routbort, J.L. (Argonne National Lab., IL). *Wear;* **67**: 227-232(1981). Contract W-31-109-ENG-38.

The results obtained in this investigation for the velocity and size dependences of the steady erosion rate in silicon single crystals are consistent with the predicted power law relation only if certain modifications are made. The velocity exponent n must depend on the particle size in such a way that n decreases as D increases, and allowance should be made for the onset of an apparent size threshold effect at small particle sizes. Further theoretical work is needed to extend the existing models, taking into acount a number of new physical features. Possible mechanism changes and thresholds seem most important in this content. Further systematic experiments are also needed to establish the important parameters and to extract reliably their phenomenological relations. It is pointed out that a cursory analysis of erosion rate data according to simple power law velocity and size dependence is likely to be inconsistent and a suitable range of D and v values must be systematically analyzed.

2884 **Diffuse x-ray scattering for the study of defects in silicon.** Larson, B.C.; Barhorst, J.F. (Oak Ridge Nationnal Lab., TN). pp 151-162 of Defects in semiconductors. Narayan; Tan (eds.). Amsterdam, Netherlands; North-Holland, Inc. (1981). Contract W-7405-ENG-26.

X-ray diffuse scattering can be used to study the size, concentration, and nature of lattice defects and defect clusters in crystalline materials. The availability of analytical models and detailed numerical calculations for the "Huang" diffuse scattering close to Bragg reflections and the "asymptotic" diffuse scattering at somewhat larger distances from Bragg reflections has made it possible to carry out detailed analyses of the intensity and angular distribution of the diffuse scattering in terms of specific defect parameters. Accordingly, diffuse scattering has been used to study point defects, dislocation loops, and precipitates in metals, semiconductors, and insulators and has provided information on defect geometries, size distributions, and concentrations. In this paper, the theoretical framework necessary for the interpretation of the "Huang" and "asymptotic" diffuse scattering from defect clusters is presented and examples of diffuse scattering calculations for defects in silicon are given. Diffuse scattering from clustered defects in silicon is discussed in terms of the type of information available from this scattering and the relative merits of diffuse scattering as an innvestigative tool for defect clusters. Diffuse scattering analysis techniques for the determination of separate size distributions for vacancy and interstitial dislocation loops in silicon are presented and applied to diffuse scattering measurements on neutron irradiated silicon. Dislocation loop densities and sizes determined in the as-irradiated state and after thermal anneals are compared with electron microscopy results.

2885 **Ionic conductivity and the weak electrolyte theory of glass.** Ingram, M.D. (Univ. of Aberdeen, Scotland); Moynihan, C.T.; Lesikar, A.V. *Journal of Non-Crystalline Solids;* No. 38-39, 371-376(1980).

Arguments are advanced in support of a weak electrolyte theory of glass which incorporates the paired interstitialcy mechanism recently proposed for $\beta$-alumina. The model can account for such heretofore unexplained phenomena as the temperature dependence of diffusion correlation factors, the mixed alkali effect and the anomalously large jump distances obtained from high-field conductivities.

2886 **Ab initio calculation of interatomic force constants in $H_6Si_2O_7$ and the bulk modulus of $\alpha$ quartz and $\alpha$ cristobalite.** Newton, M.D. (Brookhaven National Lab., Upton, NY); O'Keeffe, N.O.; Gibbs, G.V. *Physics and Chemistry of Minerals;* **6**: 305-312(1980).

Ab initio force constants calculated for Si-O stretch and Si...Si non-bonded interactions in $H_6Si_2O_7$ are found comparable with experimental values derived from the lattice dynamics of $\alpha$ quartz. The bulk moduli of $\alpha$ quartz and $\alpha$ cristobalite are calculated using the molecular Si...Si force constant and assuming rigid regular $SiO_4$ tetrahedra. In the case ($\alpha$ quartz) where data are available the calculation agrees well with experiment.

2887 **A new hydrostatic medium for diamond anvil cells to 300 kbar pressure.** Liebenberg, D.H. (Los Alamos Scientific Lab., NM). *Physics Letters;* **73A**: No. 1, 74-76(20 Aug 1979).

We have shown that the rare gas xenon provides a hydrostatic medium for gasketed samples in a diamond anvil cell to pressures of 300 kbar. Previously, hydrostatic conditions were limited to ~100 kbar in a methanol-ethanol mixture. Three spectroscopic tests were used to determine that pressure gradients were small in the solidified gas. Since xenon has a convenient melting temperature, easy cell loading is possible. The small volume in the gasket requires only a few $cm^3$ of gas. By analogy the other rare gases may be expected to show similar hydrostatic properties. Helium, for example, would be useful for X-ray studies.

# 40 CHEMISTRY

## 4001 Analytical And Separations Chemistry

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2888 **(BNL—33706) Neutron activation analyses: Teotihuacan trade ceramics.** Harbottle, G.; Sayre, E.V. (Brookhaven National Lab., Upton, NY (USA)). 1977. Contract AC02-76CH00016. 6p. (CONF-770793—1). NTIS, PC A02/MF A01. Order Number DE84000619.

From Symposium of Arquelogia historia; Guanajuato, Mexico (30 Jul 1977).

This analysis is a continuation of studies involving Mesoamerican ceramics. The activation procedure and data handling are described briefly. (DLC)

2889 **(BNL—33840) Compositional attribution of non-provenienced Maya polychrome vessels.** Bishop, R.L.; Harbottle, G.; Reents, D.J.; Sayre, E.V.; van Zelst, L. (Brookhaven National Lab., Upton, NY (USA); Texas Univ., Austin (USA). Dept. of Art History; Museum of Fine Arts, Boston, MA (USA). Research Lab.). 1983. Contract AC02-76CH00016. 23p. (CONF-8309174—2). NTIS, PC A02/MF A01. Order Number DE84002694.

From 5. international seminar applications of science in examination of works of art; Boston, MA, USA (7 Sep 1983).

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Procedures and a few of the results of the Maya ceramic project are discussed from the perspective of non-provenienced vessel attribution ranging from site specific through a more inferential level to the rather hypothetical. The examples presented serve to illustrate the manner in which compositional and stylistic covariation are viewed in an investigation of Maya Ceramic art. The large data base from neutron activation analysis including archaeologically recovered pottery as well as the stylistically and iconographically elaborate vessels requires continued refinement in our methods of statistical analysis along with gaining a greater understanding of the sources of ceramic compositional variation in the Maya area. The mutually beneficial collaboration between science, art, and archaeology are emphasized.

2890 **(CONF-8210100—6) Analytical chemistry of polycyclic aromatic hydrocarbons present in coal-fired power plant fly ash.** Tomkins, B.A.; Reagan, R.R.; Maskarinec, M.P.; Harmon, S.H.; Griest, W.H.; Caton, J.E. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE84001955.

From 7. international symposium on polynuclear aromatic hydrocarbons; Columbus, OH, USA (26 Oct 1982).

The determination of PAH on fly ash, even when using a low-concentration radioactive spike for recovery measurement, is not a straightforward procedure. The use of nonradioactive spikes as well as radioactive ones is strongly recommended to insure that the radioactive species faithfully reflects the chemistry of the analyte. The exact relationship between the native analyte and the artificially added spike still remains to be determined, and is a key to the final development and validation of analytical methods. Furthermore, it is also apparent that the exact nature of the fly ash surface, as well as air, light, and normal handling conditions, are key factors in the degradation of certain PAH.

2891 **(DP-MS—83-31-Rev.1) Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1.** Halverson, J.E. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 23p. (CONF-830539—4-Rev.1). NTIS, PC A02/MF A01. Order Number DE84002662.

From International meeting for radionuclide metrology - alpha particle spectrometry and low level measurement; Harwell, UK (10 May 1983).

Radiation counting of nuclear decay events is the most commonly used method of measuring radionuclide concentrations. However, some radionuclides, such as transuranics: $^{235}U$, $^{236}U$, $^{240}Pu$, $^{241}Pu$, $^{242}Pu$, and the fission products: $^{99}Tc$ and $^{135}Cs$ can be analyzed by mass spectrometry with greater sensitivity, ease, and/or accuracy. Mass spectrometry also offers an independent means of measuring radionuclide concentrations which can be valuable as a comparison with radiation counting. Current capabilities of mass spectrometry for analysis of selected environmental radionuclides as well as projected developments for the near future are summarized. Comparisons of cost, sensitivity, and accuracy (with a particular emphasis on sensitivity) are made for those radionuclides of most interest to environmental studies and for those most likely to lend themselves to mass spectrometric analysis. In some cases where there are presently no mass spectrometric methods which are competitive with radiation counting, limiting factors are defined, and the possibility of future developments is discussed.

2892 **(DP-MS—83-109) Ion exchange and adsorption in nuclear chemical engineering.** Schultz, W.W.; Wheelwright, E.J.; Godbee, H.; Mallory, C.W.; Burney, G.A.; Wallace, R.M. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations; Battelle Pacific Northwest Labs., Richland, WA (USA); Oak Ridge National Lab., TN (USA); Hittman Corp., Columbia, MD (USA); Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 45p. (CONF-831063—6). NTIS, PC A03/MF A01. Order Number DE84002664.

From American Institute of Chemical Engineers fall annual meeting; Washington, DC, USA (30 Oct 1983).

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The nuclear industry involves a number of operations. Uranium ore must first be mined and the uranium recovered from the ore, purified, and concentrated. After the uranium has been enriched and fabricated into fuel elements, it is placed in nuclear reactors where it produces energy, fission products, and transmutation products. Finally, if the fuel cycle is completed, the uranium and useful transmutation products are recovered and separated from each other as well as from the fission products. The uranium may be recycled or used elsewhere, while most of the fission products become waste. Ion exchange finds use in nearly every part of the nuclear fuel cycle; these uses are the subject of this paper.

2893 (INIS-BR—79, pp 141-143) **Analysis by SIMS and AES of H:$TiO_2$ electrodes.** Pena, J.L.; Farias, M.H.; Sanchez Sinencio, F. (Instituto Politecnico Nacional, Mexico City. Centro de Investigacion y de Estudios Avanzados). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

$TiO_2$ electrodes produced by heating in $H_2$ atmosphere have been analysed. SIMS (Secondary Ion Mass Spectroscopy) and AES (Auger Electron Spectroscopy) techniques were used in order to identify the atomic composition in the electrodes surface.

2894 **(INS-R—292) Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C.** Stewart, M.K.; James, M.R. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Jul 1981. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704293.

The preparation of hydrogen from water using uranium turnings at 700 deg. C for D/H analysis is described. Memory between samples is 2% and the difference between the uranium and zinc line measurements is -0.4 +- 1.0%. Standard measurements are in good agreement with normalised 1977 measurements at the Institute. It is possible to process 70 samples per week with the uranium line.

2895 **(K/PS—5013-EA) Diode laser spectrometry for monitoring acetylene on-line in a liquefaction plant.** Maddox, W.L.; Turner, C.M. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 18 Nov 1983. Contract W-7405-ENG-26. 4p. (CONF-831025—24). NTIS, PC A02/MF A01. Order Number DE84002117.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

A diode laser source infrared spectrometer has been acquired for use as an on-line monitor for acetylene in the rich (oxygen-enriched) liquid stream of the ORGDP liquefaction plant. The liquefaction plant produces high purity liquid nitrogen.

2896 (LA—9798-P, pp 399-400) **Surface studies with muons.** Daniel, H. (Technical Univ. of Munich, Germany). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment to study thin films and surface layers with muons is proposed. By observing muonic x rays a quantitative analysis even of monolayers should be feasible.

2897 **(MINTEK-M—69) Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite.** Balaes, A.M.E.; Jacobs, J.J.; Bray, A.R.; Kendrick, K. (Council for Mineral Technology, Randburg (South Africa)). 21 Mar 1983. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704295.

The method of analysis described is applicable to samples with tin and tungsten contents from 15p.p.m. to 75 per cent. For samples containing tin and tungsten in the range 2000p.p.m. to 75 per cent, the matrix variations are compensated for by the use of briquettes containing coarse river sand, the internal standard, and potassium chloride, the last of which acts as a binder, diluet, and grinding aid. For the samples containing tin and tungsten in the range 15p.p.m. to 2000p.p.m., the potassium chloride is omitted. Zinc and antimony are used as the internal standard for tungsten and tin respectively. Calibration graphs for tin and tungsten are obtained by the use of standard reference materials for cassiterite and scheelite. The precision of the analysis for tin ranges from a relative standard deviation of 0,039 at 50p.p.m. to 0,005 at 75 per cent. The values for tungsten are relatively constant at between 0,015 and 0,008 at concentrations between 50p.p.m. and 50 per cent. The lower limits of detection for tungsten and tin by the high-concentration technique of analysis are 202 and 155p.p.m. respectively, and by the low-concentration technique the corresponding limits are 4 and 2p.p.m. The overall time required for the analysis of ten samples by these techniques is approximately 3 hours. The laboratory method is detailed in an appendix.

2898 **(MINTEK-M—79) Determination, by x-ray-fluorescence spectrometry, of gold and uranium on resin.** Jacobs, J.J.; Balaes, A.M.E. (Council for Mineral Technology, Randburg (South Africa)). 4 Feb 1983. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704296.

The problems encountered in the determination of gold and uranium that are present simultaneously in a sample of resin were considered, and new background positions, as well as correction factors for background lift and partial spectral overlap, were determined for use in the X-ray-fluorescence measurement of these elements. The agreement between the results obtained by the use of the X-ray-fluorescence method and those obtained by atomic-absorption spectrophotometry were found to be satisfactory. The relative standard deviation in the former measurements is 0,005 at a concentration of 1000 p.p.m., and the working range of the calibrations is 15 to 1000 p.p.m. These limits can be extended by further dilution of the sample. The limits of determination are 6 p.p.m. in the briquette prepared from a sample of resin and 18 p.p.m. in the sample when the maximum mass of the sample is 3 g. The procedure is intended primarily for use in the rapid determination of gold and uranium when no analyses for other elements are required. The time taken for the analysis is 2 hours for 10 samples when 6 standards are used. A computer programme that was developed for the processing of the data is appended as part of a laboratory method.

2899 **(MINTEK-M—81) Application of the inductively coupled plasma system to the simultaneous determination of precious metals.** Watson, A.E.; Russell, G.M.; Middleton, H.R.; Davenport, F.F. (Council for Mineral Technology, Randburg (South Africa)). 25 Feb 1983. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704298.

This report describes the development of a spectrochemical technique using excitation by an inducticely coupled plasma (ICP) source for the simultaneous determination of the precious metals (defined here as gold, silver, and all the platinum-group metals except osmium) in a wide variety of samples from a plant for the extraction and refining of platinum metal. The limits of detection for the analytes were determined in various acid and salt media and, under the conditions used, ranged from 20 to 100ng/l. The analytes were determined in the presence of a thousandfold excess of each of the other precious metals used as a matrix element. Some severe interferences were noted but were ascribed to spectral-line overlap or to contamination of the matrix material. Various dissolution techniques, based upon standard procedures applied in the precious-metals industry, were used, depending on the particular type of material treated. The spectrometer was calibrated by the use of solutions containing the analytes, sodium chloride, and acid, with scandium as the internal standard. The accuracy and precision of the technique, established by the analysis of many samples of each type, were found to be satisfactory when close attention was paid to detail in the preparation of the analytical solution. The relative standard deviation of the method ranges from 0,005 to 0,05, depending on the element being determined.

2900 **(MINTEK-M—84) Preparation and certification of a uranium reference material.** Hansen, R.G.; Ring, E.J. (Council for Mineral Technology, Randburg (South Africa)). 25 Feb 1983. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704299.

This report describes the preparation, analysis, and certification of a bulk sample of low-grade uranium ore for use as a reference material. An investigation into its state of radioactive equilibrium establishes that the material is suitable for the purpose for which it is primarily intended, i.e. the calibration of radiometric sorting equipment on mines. Eleven South African laboratories, using several well-established analytical techniques, contributed data on the uranium content of the material.

2901 **(MLM—3112(OP)) Quantitative determination of hydrogen by pulsed nuclear magnetic resonance spectroscopy.** Attalla, A.; Bowman, R.C. Jr. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 1983. Contract AC04-76DP00053. 8p. (CONF-831025—23). NTIS, PC A02/MF A01. Order Number DE84002831.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

Hydrogen can be determined routinely in solids and liquids by pulsed nuclear magnetic resonance (NMR) when the proton spin-spin relaxation time is relatively long (>20 μsec) and the proton spin-lattice relaxation time is relatively short (<100 sec). Short spin-spin relaxation times result in intolerable loss in signal amplitude due to short-lived free-induction-decay signals. Long spin-lattice relaxation times lengthen the analysis time by lengthening the delay time between successive pulses during data accumulation. The technique is nondestructive and requires only a few milligrams of sample for solutions, and approximately 100 to 500 mg for direct analyses of solid samples. The precision (relative to the average value, and the accuracy varies from +-2 to +-5% depending on the relaxation time parameters and size of the sample. The accuracy can be improved by the method of standard additions of hydrogen and by providing standard samples which reflect the physical and chemical properties of the analytical samples. The technique has been applied to the determination of moisture in solids and liquids, to the determination of hydrogen stoichiometry in solid metal hydrides, impurity analyses, compound identification, and molecular structure confirmation.

2902 **(NP—3770423) Catalytic-kinetic micro trace determination of fluoride in environmental matrixes.** Auffahrt, J. (Dortmund Univ. (Germany, F.R.). Abt. Chemie). 18 Dec 1979. 238p. (In German). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83770423.

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The thesis describes the development of a compound method for determination of very small fluoride quantities and consists of a catalytic-kinetic determination of fluoride and closely coupled to that of a separation and concentration step. The strongly inhibiting property of fluoride in the Zr-catalyzed reaction between perborate and iodide is used to build up a sensitive determination method. To eliminate disturbances by impurities it was essential to separate the fluoride from the matrix in the samples by microdiffusion using hexamethyldisiloxane as diffusion accelerator. The method was used for micro and trace determinations of fluoride in environmental matrixes. Biological materials, mineral and soil samples were investigated and the accuracy of the results was secured by ring investigations. Furthermore the fluoride content of rain water was determined over a period of 11/2 year. The fluoride content of aerosol filter samples was determined, too. A plant for continuous generation of test gases is described which show HF contents of a few ppb until ppm. The test gas source bases upon the permeation of HF from an aqueous HF solution through a polyethylene tube

into a carrier gas flow. Thus mistakes at sampling of hydrogen-fluoride traces in atmosphere were excluded.

**2903 (PB—83-240861) Euracos activation experiments: preliminary uncertainty analysis.** Yeivin, Y. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). [nd]. 31p. (EUR—8011-EN). NTIS, PC E03/MF E03.

The EURACOS II facility consists of a quasi-circular fission plate, placed at the end of the thermal column of the LENA reactor of the University of Pavia. It was used to study the penetration of the fission neutrons into an iron block. In the present study we consider the experiments involving the sulphur detectors. Each sulphur sample (pellet or tablet) is irradiated at a certain position along the axis of the iron block, and then its activity is measured at several times, t(i), after the end of the irradiation, during time intervals dt(i). From the corresponding counts, c(i), a background count (the beta-spectrometer count with no sample) is subtracted, and the resulting net counts, divided by the appropriate dt(i), yield the counting rates r(i) at times t(i). The purpose of this preliminary analysis is to extrapolate these data, the r(i), to time t(o)= 0, and obtain the sample counting rate at that time. (Copyright (c) ECSC-EEG-EAEC Brussels - Luxembourg 1982).

**2904 (SAND—83-2234C) Status report on the ASTM E-42 Committee on Surface Analysis.** Nelson, G.C. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 20p. (CONF-831191—1). NTIS, PC A02/MF A01. Order Number DE84002537.

From Quantitative surface analysis conference; Teddington, UK (22 Nov 1983).

Committee E-42 on Surface Analysis was formed by the American Society for Testing and Materials in 1976 from its predecessor, Subcommittee E-02.02, to advance the quality of standard practices, standard materials, and reference data in the area of surface analysis. These objectives are accomplished through sponsoring symposia and workshops at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy in the spring and the National Symposium of the American Vacuum Society in the fall as well as through the development of recommended practices, standard materials, round robin comparisons, and publications. Subcommittees which are currently active are Editorial, Terminology, Standard Reference Materials, Ion Beam Sputtering, Energetic Ion Analysis, Auger, ESCA, ISS, and SIMS. This report summarizes their progress through the end of 1983.

**2905 Total spin coherence transfer echo spectroscopy.** Garbow, J.R.; Weitekamp, D.P.; Pines, A. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **79**: No. 11, 5301-5310(1 Dec 1983).

The sensitivity of multiple quantum NMR transitions to magnetic field inhomogeneity and the relative phases and amplitudes of multiple quantum lines are discussed. The technique of total spin coherence transfer echo spectroscopy (TSCTES) is described and experimentally demonstrated. The TSCTES method allows multiple quantum spectra to be obtained which are free of inhomogeneous magnet broadening, yet remain sensitive to spin—spin couplings and chemical shift differences. The method takes advantage of the properties of the total spin coherence, the unique transition between the extreme eigenstates of a coupled spin system. Experimental results are reported for partially oriented acetaldehyde and are analyzed in terms of irreducible tensor operators. Limitations on the method and extensions to heteronuclear spin systems are also discussed.

**2906 Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills.** Bingham, G.E.; Kiefer, R.D.; Gillespie, C.H.; McRae, T.G.; Goldwire, H.C.; Koopman, R.P. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Review of Scientific Instruments;* **54**: No. 10, 1356-1361(Oct 1983). Contract W-7405-ENG-48.

We have developed a four-band, IR radiometer for measuring methane and ethane plus propane in the 1% to 100% gas per volume of air range in liquefied natural gas spills. The instrument is a small and lightweight open-cell, pyroelectric detector-based sensor designed for field use. It compensates for attenuation because of dense fog and is sufficiently hardened to allow continuous operation in the transient flame front of an ignited natural gas cloud. The sensor transmits five determinations of the gas concentration each second to a data-collection station on an interrupt-driven, serial data link. It has an operational power requirement of 15 W at 12 V dc.

**2907 Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions.** Eisch, J.J.; Hallenbeck, L.E.; Han, K.I. (State Univ. of New York, Binghamton). *Journal of Organic Chemistry;* **48**: No. 18, 2963-2968(9 Sep 1983). Contract AC22-79ET14879;FG22-81PC40782.

Two equivalents of the complex (2,2'-bipyridyl)(1,5-cyclooctadiene)nickel(0) cleave dibenzothiophene in homogeneous media to form nickel-substituted biphenyl derivatives and nickel sulfide. The cleavage proceeds more readily in tetrahydrofuran (THF) than in benzene solution, and excess amine (either bipyridyl or pyridine) retards the reaction. Neither biphenylene nor 2-phenylbenzenethiol was a detectable transient in the desulfurization process. The possible fleeting formation of biphenylene was ruled out by a study of the desulfurized products obtained from the 2,8-dimethyl and the 3,7-dimethyl derivatives of dibenzothiophene. A possible role of nickel hydride in some of the C-S bond cleavage is suspected from the observed effects of either acid or lithium aluminum hydride ($LiAlH_4$) used in the workup of the reaction mixture. The reaction is not catalytic in nickel when an excess of $LiAlH_4$ is used; indicating that Ni(0) cannot be regenerated from NiS under these conditions. The observed cleavage of ~ 50% of the dibenzothiophene by 2 equiv of (2,2'-bipyridyl)(1,5-cyclooctadiene) nickel [$(C_{10}H_8N_2)Ni(C_8H_{12})$] is ascribed to the gradual formation of bis(cyclooctadiene) nickel [$(C_{10}H_8N_2)_2Ni$] which is ineffectual in cleaving dibenzothiophene. Finally, the relative reactivity of the dibenzothiophenes (dibenzothiophene > 2,8-dimethyldibenzothiophene >> 3,7-dimethyldibenzothiophene), the relative effectiveness of amine donors or solvents, and the observed hydrogen abstraction from the solvent are interpreted in terms of an electron-transfer mode of action by the nickel(0) desulfurizing agent.

**2908 Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation.** Heinz, T.F.; Tom, H.W.K.; Shen, Y.R. (Department of Physics, University of California, Berkeley, California 94720 and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1883-1885(Sep 1983). Contract AC03-76SF00098.

Optical second-harmonic generation has been used to deduce the average arrangement and orientation of p-nitrobenzoic acid molecules adsorbed at air-silica and ethanol-silica interfaces. An adsorption isotherm for the liquid-solid interface has also been obtained.

**2909 Selective $M^+$-$H^+$ coupled transport of cations through a liquid membrane by macrocyclic calixarene ligands.** Izatt, R.M.; Lamb, J.D.; Hawkins, R.T.; Brown, P.R.; Izatt, S.R.; Christensen, J.J. (Brigham Young Univ., Provo, UT). *Journal of the American Chemical Society;* **105**: No. 7, 1782-1785(6 Apr 1983). Contract AC02-78ER05016.

Macrocylic p-tert-butylcalix[4]arene, -calix[6]arene, and -calix[8]arene have been studied as cation carriers in $H_2O$-(organic solvent)-$H_2O$ liquid membranes. When the source water phase is a solution of the metal nitrate salt, no cation transport through the membrane $CCHCl_3$) is observed with these ligands in contrast to measurable transport when the macrocyclic carrier, 18-crown-6, is present. However, if the source phase is a solution of the metal hydroxide, transport of cations is observed with calixarenes but not with 18-crown-6 in the membrane (25% v/v $CH_2Cl_2$-$CCl_4$). Transport by the calixarenes is selective for $Cs^+$ over other alkali metal cations with the selectivity increasing in the order [8] < [6] < [4]. Preliminary work with p-tert-pentylcalix[4]arene and -calix[8]arene shows transport behavior to be similar to that of the corresponding p-tert-butylcalixarenes. These calixarene ligands offer several fea-

tures desirable to membrane carriers: (1) low water solubility, (2) formation of neutral complexes with cations through loss of a proton, and (3) the potential for coupling cation transport to the reverse flux of protons.

2910 **Cation fluxes from binary $Ag^+$-M/sup n+/ mixtures in a $H_2O$-$CHCl_3$-$H_2O$ liquid membrane system containing a series of macrocyclic ligand carriers.** Izatt, R.M.; Dearden, D.V.; Brown, P.R.; Bradshaw, J.S.; Lamb, J.D.; Christensen, J.J. (Brigham Young Univ., Provo, UT). *Journal of the American Chemical Society;* **105**: No. 7, 1785-1790(6 Apr 1983). Contract AC02-78ER05016.

Cation fluxes were determined for $Ag^+$-M/sup n+/ binary cation mixtures in a $H_2O$-$CHCl_3$-$H_2O$ liquid membrane system, using macrocyclic ligands as carries. Alkali metal, alkaline earth metal, $Pb^{2+}$, and $Tl^+$ cations served as M/sup n+/ in these experiments while macrocyclic polyether ligands having varying ring cavity radii, donor atom types, and substituents served as carriers. Correlations were found between relative cation transport rates and these ligand structural features as well as the equilibrium constant (K) for the formation of the various cation-macrocycle complexes. Selection of macrocycles having proper carrier cavity radii and appropriate combinations of oxygen with either nitrogen or sulfur donor atoms led to selective transport of $Ag^+$ in preference to any of the other cations studied. Transport was also enhanced by certain aliphatic substituents on the macrocycles. The most effective macrocycles in transporting large quantities of $Ag^+$ in the presence of M/sup n+/ were diketopyridino-18-crown-6(DKP18C6), diketopyridino-21-crown-7 (DKP21C7), 4-octoxydiketopyridino-18-crown-6 (ODKP18C6), and dicyclohexano-18-crown-6 (DC18C6). Silver ion was transported selectively by these ligands over all M/sup n+/ cations studied except in the cases of $Pb^{2+}$, which was transported in preference to $Ag^+$ by DKP18C6, ODKP18C6, DC18C6; $Tl^+$, which was transported preferentially by DKP21C7 and DC18C6; and $Ba^{2+}$ and $Sr^{2+}$, which were transported selectively by DC18C6.

2911 **Basic assumptions and recent developments in quantitative XPS.** Carlson, T.A. (Oak Ridge National Lab., TN). *Surface and Interface Analysis;* **4**: No. 4, 125-134(1982). Contract W-7405-ENG-26.

A review is made of the basic assumptions used in quantitative x-ray photoelectron spectroscopy (XPS). Particular attention is paid to problems of electron shake up and shake off, and to the angular distribution of ejected photoelectrons. Following this review, the interaction of XPS with other surface analyses is discussed and illustrated for UPS, ion-scattering spectroscopy (ISS), and photon-induced Auger electron spectroscopy (AES). The paper is concluded with a discussion of the future possible uses and advantages of synchrotron radiation for XPS including the development of XPS for microprobe analysis.

## 4002 Inorganic And Physical Chemistry

*REFER ALSO TO CITATION(S) 1758, 1797, 2070, 2085, 2867, 2979, 3006, 3015, 3593, 3595*

2912 **(AD-A—131709/8) Chemiluminescence and laser induced fluorescence of boron atom reactions. Final progress report.** Davidovits, P. (Boston Coll., Chestnut Hill, MA (USA). Dept. of Chemistry). 30 Jun 1983. 21p. NTIS, PC A02/MF A01.

The purpose of the work sponsored by grant AFOSR 80-0061 was to study the highly exoergic gas phase reactions of boron atoms. The main goal of these studies is to obtain a basic understanding of exoergic reactions of non metal atoms. These types of reactions play a fundamental role in fields such as combustion, plasma chemistry, laser induced chemistry and chemical lasers. We have completed rate and chemiluminescence studies of boron atom reactions with most of the important oxygen containing molecules of interest. From the results of these studies we are now able to suggest a qualitative model that may explain the nature of these reactions.

2913 **(CONF-821053—4) Control of redox conditions during sorption measurements.** Meyer, R.E. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE84002065.

From Workshop on standardization of methods for measuring migration of radionuclides in geomedia; Berlin, F.R. Germany (25 Oct 1982).

The sorption properties of a nuclide may be strongly dependent on its valence, so it is important to determine the valence state of the nuclide and its adsorbed species. The usual methods of valence state determination are spectrophotometry, solvent extraction, and coprecipitation. The problem of determining the valence state of an adsorbed species at low concentration levels is discussed. Potential pH diagrams may be used to predict the valence state change of a reaction. Redox buffers may be used in order to control the valence state of an element in sorption experiments. The electrolytic method of controlling valence has been found to be a particularly convenient method. (DLC)

2914 **(DOE/ER/01713—T2) Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983.** Gaspar, P.P. (Washington Univ., St. Louis, MO (USA). Dept. of Chemistry). 31 Oct 1983. Contract AC02-76ER01713. 9p. NTIS, PC A02/MF A01. Order Number DE84002603.

Progress in three areas important to attaining the goals of this research program are briefly reviewed: (a) rearrangements interconverting divalent silicon species, silylenes, and molecules containing silicon-silicon double bonds, silenes; (b) the laser photolysis of polysilanes (c) the reactions of high energy recoiling carbon atoms.

2915 **(LBL—16569) Some recent advances in uranocene chemistry.** Streitwieser, A. Jr. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 30p. (CONF-8309124—3). NTIS, PC A03/MF A01. Order Number DE84001044.

From 1. international conference on the chemistry and technology of the lanthanides and actinides; Venice, Italy (5 Sep 1983).

This document reports on the synthesis and NMR spectral study of the uranocene structure derived from benzocyclooctatetraene. 6 figures, 4 tables. (DLC)

2916 **(NP—3770429) Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface.** Schmick, H.D. (Marburg Univ. (Germany, F.R.). Fachbereich Physik). 22 Dec 1981. 140p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770429.

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The first chapter describes the surface analysis instrument. The chapter of preparation of the Pd(111)-surface and characterization of its properties deals with crystal-preparation and control of the chemical property by means of Auger-electron-spectroscopy (AES) and investigation of surface structure by means of diffraction of slow electrons (LEED). The chapter of investigation of interaction of NO with a Pd(111)-surface treats adsorption, dissociation and consecutive reactions and desorption.

2917 **(NP—3770430) Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2$/$H_2O$ on ZnO/GaAs.** Mokwa, W. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 26 May 1981. 137p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770430.

Adsorption and decomposition of $H_2O$, $H_2$, ethanol and acetaldehyde on semi-conductor surfaces were measured and the influence of metal adsorption in the monolayer range on catalytic decomposition was investigated. Mass-spectrometric investigations were combined with measurements of surface conductivity. Surface covering was determined by means of Auger-electron spectroscopy. LEED was used to recognize "island growth". On GaAs(110) $H_2$ is adsorbed only atomically and is desorbed as molecular $H_2$. Water is adsorbed in 2 states on GaAs. The initial adsorption coefficient of

Zn is lower on the Zn-surface than on the O-surface. On both surfaces Zn adsorbs in 2 states. The state with lower activation energy causes an ascent of surface conductivity on both surfaces. At coverings above one monolayer the "island growth" turns into epitactic growth of a Zn-lattice. Among other things atomic hydrogen reacts with lattice-oxygen to form $H_2O$. Ethanol decomposes on ZnO to $CH_3CHO$ and $H_2$ and to $C_2H_4$ and $H_2O$. Above 400 K surface conductivity increases. This rise is parallel to the decomposition of $CH_3CHO$ where $O_2$-vacancies are generated. The ethanol decomposition needs a lower activation energy on the prism surface than on the oxygen surface. Adsorption of Cu on the oxygen surface lowers the decomposition temperature.

2918 **(PB—83-241414) Optically-pumped mercury vapour cell in coaxial geometry. No. 1. Transport of resonance radiation.** Johnson, P.C.; Allen, J.E. (Oxford Univ. (UK). Dept. of Engineering Science). 1978. 20p. (OUEL—1254/78). NTIS, PC E03/MF E03.

The transport of Hg resonance radiation to a cylindrical cell from a coaxial source is discussed using a diffusion model. The calculated dependency on source intensity (current) and cell mercury atom number density is in reasonably good agreement with 6 triplet P(1) populations measured by absorption spectroscopy.

2919 **(PB—83-241422) Optically-pumped mercury vapour cell in coaxial geometry. 2. Optical pumping by lines in the visible triplet.** Johnson, P.C.; Allen, J.E. (Oxford Univ. (UK). Dept. of Engineering Science). 1979. 40p. (OUEL—1277/79). NTIS, PC E04/MF E04.

A theoretical basis is developed for the transport of Hg visible triplet radiation to a cylindrical cell from an annular source surrounding it. This is used to describe the relative magnitudes of optical pumping terms in a kinetic scheme for the 6 triplet P level populations. These terms are quantified using experimental data. A kinetic scheme which includes atomic quenching from 6 triplet(P)sub 1 to 6 triplet(P) sub but discounts 6 triplet(P) sub 0 - 6 singlet (S) sub 0 quenching provides a good fit to experimentally measured populations, casting doubt on the high cross-section for the latter process found in the literature.

2920 **Quantum mechanical rate constants for bimolecular reactions.** Miller, W.H.; Schwartz, S.D.; Tromp, J.W. (Department of Chemistry, and Materials and Molecular Research Division of the Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **79**: No. 10, 4889-4898(15 Nov 1983).

Several formally exact expressions for quantum mechanical rate constants (i.e., bimolecular reactive cross sections suitably averaged and summed over initial and final states) are derived and their relation to one another analyzed. It is suggested that they may provide a useful means for calculating quantum mechanical rate constants accurately without having to solve the complete state-to-state quantum mechanical reactive scattering problem. Several ways are discussed for evaluating the quantum mechanical traces involved in these expressions, including a path integral evaluation of the Boltzmann operator/time propagator and a discrete basis set approximation. Both these methods are applied to a one-dimensional test problem (the Eckart barrier).

2921 **Adiabatic and diabatic reactions of S($^1$D) atoms with OCS: Internal state distribution of the $S_2$ products.** van Veen, N.; Brewer, P.; Das, P.; Bersohn, R. (Columbia University, New York, New York 10027). *Journal of Chemical Physics;* **79**: No. 9, 4295-4301(1 Nov 1983).

OCS at low pressure was photodissociated at 248 nm. It was shown by two photon laser induced fluorescence (LIF) that the concentration of the S($^1$D) atoms produced decays with time due to collisions with undissociated OCS molecules. In contrast, the S($^3$P) atom concentration rises from zero or nearly zero to a maximum and then subsequently decays. The S($^1$D) atoms react with OCS molecules to give $S_2$ (X $^3\Sigma$/sub g/), $S_2$(a $^1\Delta$/sub g/), and S($^3$P). The rotational and vibrational distribution of the diatomic products was studied by LIF. The diabatic product $S_2$(X $^3\Sigma$/sub g/ ) was entirely in the v = 0 state and was rotationally cold. The adiabatic product $S_2$(a $^1\Delta$) was probed in the v = 1 state and had a fairly narrow non-Boltzmann type rotational distribution peaking at J = 65. We speculate that the reaction takes place through a $C_2$/sub v/ $COS_2$ intermediate. The adiabatic and diabatic reactions are characterized by sequential and concerted C—S bond breaking, respectively.

2922 **Reduced dimensionality quantum rate constants for the D+$H_2$(v = 0) and D+$H_2$(v = 1) reactions on the LSTH surface.** Bowman, J.M.; Lee, K.T.; Walker, R.B. (Department of Chemistry, Illinois Institute of Technology, Chicago, Illinois 60616). *Journal of Chemical Physics;* **79**: No. 8, 3742-3745(15 Oct 1983).

Collinear exact quantum reaction probabilities for the D+$H_2$(v = 0) and D+$H_2$(v = 1) reactions were calculated using the ab initio surface of Liu and Siegbahn (as fit by Truhlar and Horowitz) with an adiabatic treatment of the ground state bend. These probabilities are used to obtain approximate three-dimensional thermal rate constants which are compared with experiment and other calculations.

2923 **Supported palladium catalysts for the reduction of sodium bicarbonate to sodium formate in aqueous solution at room temperature and one atmosphere of hydrogen.** Stalder, C.J.; Chao, S.; Summers, D.P.; Wrighton, M.S. (Massachusetts Inst. of Tech., Cambridge). *Journal of the American Chemical Society;* **105**: No. 20, 6318-6320(5 Oct 1983).

The reduction has been effected by using a variety of Pd (palladium)-based catalysts. The typical procedure was to suspend 0.25 g of catalyst in 25 cc of an aqueous solution of sodium bicarbonate purged slowly with hydrogen gas. The sodium formate concentration was followed by withdrawing aliquots for formate determination by $^{13}$C, /sup H/NMR. The reduction may be quite rapid; an initial rate of reduction after 1 h reaction produces a turnover rate of 35 formate anions produced/ palladium atom/h. All forms of Pd used appear to be active. The overall results indicate that carbon dioxide may be reduced at room temperature near its thermodynamic potential. 2 figures, 1 table.

2924 **Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls.** Crawford, J.E. (Virginia Commonwealth Univ., Richmond); Melson, G.A.; Makovsky, L.E.; Brown, F.R. *Journal of Catalysis;* **83**: No. 2, 454-463(Oct 1983). Contract AC22-79PC10318.

An extraction technique for the preparation of alumina-supported iridium and osmium carbonyls from $Ir_4(CO)_{12}$ and $Os_3(CO)_{12}$ is reported. It is concluded that the metal carbonyl species produced are highly dispersed and of small particle size (less than 50 A diameter) in contrast to the large crystallites of iridium and osmium carbonyls obtained by either the dry grinding or wet impregnation techniques. Partial decarbonylation of the metal carbonyl species can be effected by varying the conditions of the preparation and by heating the samples in air, the species $[Ir(CO)_2]^+$ and [Os(CO)/sub n/]$^{2+}$, n = 2,3, have been identified from their infrared spectra. Strong interactions between the metal carbonyl species and the alumina support are present. 2 figures, 1 table.

2925 **Lifetimes of the ligand-to-metal charge-transfer excited states of iron(III) and osmium(III) polypyridine complexes. Effects of isotopic substitution and temperature.** Bergkamp, M.A.; Guetlich, P.; Netzel, T.L.; Sutin, N. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* **87**: No. 20, 3877-3883(29 Sep 1983).

The lifetimes of the ligand-to-metal charge-transfer (LMCT) excited states produced by 527-nm excitation of $M(phen)_3^{3+}$ and $M(bpy)_3^{3+}$ (M = Fe or Os (iron or osmium); phen = 1,10-phenanthroline; bpy = 2,2'-bipyridine) are reported at temperatures between 10 and 295 K and are compared to the low-temperature lifetimes of the metal-to-ligand charge-transfer (MLCT) excited states of the corresponding $M(phen)_3^{2+}$ and $M(bpy)_3^{2+}$ complexes. The observations that the MLCT states of the Osmium(II) complexes are $10^5$-$10^6$ times longer-lived than the LMCT states of the Os(III) complexes (microseconds vs. picoseconds) and that the lifetimes of both types of charge-transfer states are increased less than a factor of 3 upon deuteration are rationalized in terms of radiationless-decay theory. The dominant active modes for both types of charge-

transfer states appear to be intermediate-frequency (1300 to 1600 $cm^{-1}$) vibrations and it is proposed that the shorter lifetimes of the Os(III) complexes are mainly a consequence of their smaller energy gaps. 5 figures, 3 tables.

2926 **Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond.** Muralidharan, S.; Espenson, J.H. (Ames Lab., IA). *Inorganic Chemistry;* **22**: No. 20, 2786-2787(28 Sep 1983). Contract W-7405-ENG-82.

The reactions of dinuclear haloplatinum complexes (or analogous cationic complexes) $X_2Pt_2(\mu\text{-dppm}$ = bis(diphenylphosphino)methane and $X_2$ = dibromo, diiodo, dichloro, chloro, or dipyridinium, diammine, dicarbonyl] and diazomethane were studied in purified dichloromethane. Uv-visible spectra and product isolation showed that these reactions proceed smoothly with no detectable concentration of any reaction intermediate. Kinetic data were obtained as a result of experiments performed using an excess of diazomethane. The rate constants are summarized for various concentrations of diazomethane. The reaction rate drops off sharply when both halides are replaced by neutral amine and pyridine ligands, and even the carbonyl complex reacts only 2% as rapidly as the most inactive species of the halides. Irregular rate variations are found among the dihalides. The rate constants are characterized by an activation entropy which is nearly zero. 1 figure.

2927 **Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride.** Ford, J.E.; Corbett, J.D.; Hwu, S.J. (Ames Lab., IA). *Inorganic Chemistry;* **22**: No. 20, 2789-2790(28 Sep 1983). Contract W-7405-ENG-82.

The incorporation of guest impurity atoms is demonstrated in the chemistry of yttrium chloride(YCl). These new phases are all synthesized as black plates by stoichiometric reaction of metal powder or strips with the trichloride and M/sup I/Cl[M/sup I/ = lithium-cesium (LiCs)], chloride yttrium oxide ($Y_2O_3$), scandium chloride (ScCl), yttrium oxychloride (YOCl), or carbon (C) within sealed tantalum tubing at 950°C for 1 to 3 weeks. The new phases are $Li_{0.09}YCl$, $ScClC_{0.5}$, $M_{0.1}$/sup I/YClO, and $M_{0.2}$/sup I/$YClC_{0.5}$. The yields for all the compounds except $Li_{0.09}YCl$ are greater than 90%. The products are stable at high temperatures and well crystallized, in contrast to many reported intercalation compounds. The structure refinement is discussed. 1 figure.

2928 **Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation.** Parker, S.F.; Peden, C.H.F.; Barrett, P.H.; Pearson, R.G. (Univ. of California, Santa Barbara). *Inorganic Chemistry;* **22**: No. 20, 2813-2818(28 Sep 1983). Contract AM03-76SF00034.

The reactions of matrix-isolated iron atoms and clusters with the alkenes ethylene and propylene have been investigated by infrared and Moessbauer spectroscopies. In ethylene at low temperatures (<18 K) and with low iron concentrations (<1%) the major product is iron/ethylene comples [$Fe(C_2H_4)$]. This is the only monoiron product formed, although unreacted iron atoms can be observed in pure ethylene at 4.2 K. Irradiation with the unfiltered output of a high-pressure Xe lamp causes the unreacted iron atoms to react to $Fe(C_2H_4)$. At higher temperatures and iron concentrations additional products $Fe_x(C_2H_4)$/sub x/ (x = 1, 2) and Fe/sub p/$(C_2H_4)$/sub p/ (p > 2) are formed. Moessbauer spectra of iron/propylene complex [$Fe/C_3H_6$] at both 4.2 and 20 K are very similar to those of $Fe/C_2H_4$. Hence the products are similarly assigned to $Fe(C_3H_6)$, $Fe_2(C_3H_6)_2$, and Fe/sub p/$(C_3H_6)$/sub p/ (p > 2). The Moessbauer spectra of the products indicate that the electronic configuration of the iron atoms in the alkene complexes is approximately $(4s)^1(3d)^7$, in agreement with theoretical work. The Moessbauer spectra of $Fe(C_2H_4)$ and $Fe(C_3H_6)$ are also consistent with the proposal that $C_2H_4$ and $C_3H_6$ are primarily $\sigma$ donors with only minimal d/sub $\pi$/$\rightarrow\pi^*$ back-bonding. 8 figures, 2 tables.

2929 **Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum.** Kurihara, K.; Fendler, J.H. (Clarkson Coll. of Tech., Potsdam, NY). *Journal of the American Chemical Society;* **105**: No. 19, 6152-6153(21 Sep 1983).

Preparation of the polymerized surfactant vesicle matrix and the colloidal platinum catalyst within this matrix is described. Colloidal formation and polymerization were monitored by absorption spectroscopy. The catalytic efficiency of vesicle entrapped colloidal platinum was demonstrated. Bubbling of hydrogen through a solution containing this vesicle resulted in the reduction of methylene blue and 10-methyl-5-deazaisoalloxazine-3-propanesulfonic acid. No reduction occurred in the absence of the colloidal platinum either in vesicles or in homogeneous solutions. The reduced polymer matrix can be reoxidized by the addition of ferric chloride. The feasibility of the use of these systems was demonstrated satisfactorily. 3 figures.

2930 **Synthesis and chemistry of chiral vinyl rhenium complexes (eta-$C_5H_5$)Re(NO)(PPh$_3$)(CH==CHR). Stereoselective reactions with electrophiles and a spontaneous alkylidene to olefin rearrangement.** Hatton, W.G. (Univ. of California, Los Angeles); Gladysz, J.A. *Journal of the American Chemical Society;* **105**: No. 19, 6157-6158(21 Sep 1983).

Results show that chiral vinyl rhenium complexes can undergo electrophilic attack with appreciable 1,3-asymmetric induction. Although these complexes react only with strong electrophiles, predictions should show that species of greater nucleophilicity should be considerable in synthesis. A 2-step alkene $\rightarrow$ alkylidene rearrangement has been proposed as an initiating step in olefin metathesis. Such transformations might well be concerted and stereoselective. 1 figure.

2931 **Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$.** Moodenbaugh, A.R.; Hartt, J.E.; Hurst, J.J.; Youngblood, R.W.; Cox, D.E.; Frazer, B.C. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] B: Condensed Matter;* **28**: No. 6, 3501-3505(15 Sep 1983).

Polycrystalline $H_2SO_4$ and $H_2SeO_4$ were studied by powder neutron-diffraction techniques at temperatures near the melting points and at 10 K. This work was undertaken to determine hydrogen positions and to search for order-disorder transitions in the hydrogen-bond networks. Rietveld refinement located the hydrogen positions and established that the hydrogen atoms are ordered at the temperatures studied (i.e., no ordering transitions). The other atom positions were found to be consistent with those determined in earlier x-ray single-crystal analyses of the $H_2SO_4$ and $H_2SeO_4$ crystal structures.

2932 **Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111).** Garfunkel, E.L. (Lawrence Berkeley Lab., CA); Maj, J.J.; Frost, J.C.; Farias, M.H.; Somorjai, G.A. *Journal of Physical Chemistry;* **87**: No. 19, 3629-3635(15 Sep 1983). Contract AC03-76SF00098.

The interaction of coadsorbed potassium with $\pi$-orbital containing molecular adsorbates (benzene, phosphorous trifluoride ($PF_3$), nitric oxide (NO), butene ($C_4H_8$), and acetonitrile ($CH_3CN$) on the Pt(111) crystal face was studied by thermal desorption spectroscopy. Coadsorbed potassium significantly weakened the platinum-benzene bond. More of the benzene desorbed intact upon heating, instead of dissociating to yield $H_2$ and surface carbon. In contrast, previous studies have shown that coadsorbed potassium substantially increases the platinum-carbon bond strength for adsorbed CO.[1] Adsorbed NO was found to dissociate in an amount proportional to the K concentration, yielding $N_2$ and $N_2O$ (as well as NO) in the desorption spectra. The adsorption of $PF_3$, $C_4H_8$, and $CH_3CN$ was blocked by potassium, and no additional or shifted peaks were observed. A molecular orbital description is given to account for the potassium-induced effects. The authors propose that only adsorbates having molecular orbitals with energy levels located near E/sub f/ (Fermi level) can be significantly affected by electronic promotion in catalysis. 8 figures.

2933 **Catalytic decomposition of gaseous $SO_3$.** Brittain, R.D.; Hildenbrand, D.L. (SRI International, Menlo Park, CA). *Journal of Physical Chemistry;* **87**: No. 19, 3713-3717(15 Sep 1983).

The effectiveness of a number of potential catalysts for the process $SO_3 \rightarrow SO_2 + 1/2O_2$ was studied by admitting gaseous

$SO_3$ to an alumina reactor containing the material and monitoring the exit gas composition by mass spectrometry. Measurements were made over the range 600 to 1000 K, at initial $SO_3$ pressures of about 1 x $10^{-6}$ atm. Several metal and metal oxide powders found to be effective catalysts for $MgSO_4$ decomposition were also found to catalyze $SO_3$ decomposition, although there was a considerable spread in the onset temperatures of catalytic activity; these ranged from about 600 K for Pt and Ru to about 850 K for CoO. The metal oxides are effective only over the region in which the corresponding sulfates are unstable. The results offer an insight to the lack of catalytic activity of the oxides toward other metal sulfates. 4 figures, 6 tables.

2934 **High-resolution silicon-29 nuclear magnetic resonance and neutron powder diffraction study of Na-A zeolite. Loewenstein's rule vindicated.** Bennett, J.M. (Union Carbide Corp., Tarrytown, NY); Blackwell, C.S.; Cox, D.E. *Journal of Physical Chemistry;* **87**: No. 19, 3783-3790(15 Sep 1983). Contract AC02-76CH00016.

The structure of a sample of sodium (Na)-A zeolite dehydrated by heating at 300°C was examined by magic angle spinning (MAS) silicon 29 ($^{29}Si$) NMR and neutron powder diffraction techniques. The $^{29}Si$ NMR chemical shifts for Na-A zeolite and a series of nitrogenous A zeolites with various Si aluminum (Al) ratios demonstrate conclusively that in the former each Si is surrounded by four Al and no Si near neighbors. This 4:0 ordering scheme is consistent with previous x-ray structure determinations and does not violate Loewenstein's rule. Neutron powder diffraction data taken at 4.5 and 296 K reveal that this sample of Na-A zeolite has rhombohedral symmetry at these temperatures, in agreement with the results of a recent neutron study by Bursill et al., but different from the cubic Fm3c symmetry reported in an independent neutron investigation by Adams et al., and a recent x-ray single-crystal study by Pluth and Smith. However, there is a transition to the cubic structure at about 335 K. Structural analysis at selected temperatures between 4.5 and 603 K was carried out by Rietveld refinement of the neutron data. Above the transition, the results are consistent with the x-ray single-crystal refinement by Pluth and Smith. Below the transition, constrained refinement strongly indicates that ordering of Na atoms in partially occupied sites takes place, with a consequent lowering of the symmetry to at least R3c. Since the present sample contains about 3 wt % of water which can only be driven off by heating between 400 and 700°C, it seems likely that the presence or absence of a transition depends upon the nature and extent of the residual hydration. 9 figures, 5 tables.

2935 **Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding.** Corbett, J.D. (Ames Lab., IA). *Inorganic Chemistry;* **22**: No. 19, 2669-2672(14 Sep 1983). Contract W-7405-ENG-82.

Trends in binding energies of the zirconium (Zr) 3d/sub 5/ 2/ and chlorine (Cl) 2p/sub 3/2/ levels for Zr, zirconium chloride/ sub n/ [ZrCl/sub n/] (n = 1-4), zirconium bromide (ZrBr), zirconium X hydride/sub x/ (ZrXH/sub x) (X = Cl, Br; x = 0.5, 1), and $ZrClO_{0.4}$ are considered as a function of oxidation state. The zirconium binding energy exhibits a regular and consistent increase on oxidation for all phases with formal oxidation states between 0 and +2, while those for $ZrCl_3$ and $ZrCl_4$ are displaced about 1.3 eV to higher binding energy. Structural and property data for the compounds suggest that the break in zirconium binding energy takes place at the point at which metal-metal bonding and the consequent valence-electron delocalization cease. This effect is considered in terms of the metal valence bands and the final-state relaxation processes that occur in response to the core hole. The apparent relaxation is otherwise remarkably insensitive to differences in valence bands and structure. The only change of significance seen in the chlorine data reflects the different Fermi level reference in $ZrCl_4$. 2 figures, 1 table.

2936 **Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$.** Rosenberg, R.A.; Rehn, V.; Green, A.K.; LaRoe, P.R.; Parks, C.C. (Michelson Laboratory, Physics Division, Naval Weapons Center, China Lake, California 93555). *Physical Review Letters;* **51**: No. 10, 915-918(5 Sep 1983).

Results of photon-stimulated ion desorption measurements from solid $N_2$, CO, and $C_2H_2$ are presented in the photon energy range $17<h\nu<35$ eV. The photon energy dependence of the ion yields illustrates the importance of electron correlation desorption. On the surface of solid $N_2$, charge localization on the nitrogen atom nearest the surface causes the $N^+$ spectral yield to differ from the $N^+$ yield from gaseous $N_2$ and to resemble the $O^+$ yield from CO. The effect of hole migration on desorption from physisorbed systems is discussed.

2937 **Accurate calculations of the rate constants and kinetic isotope effects for tritium-substituted analogues of the H + $H_2$ reaction.** Truhlar, D.G. (Univ. of Minnesota, Minneapolis); Grev, R.S.; Garrett, B.C. *Journal of Physical Chemistry;* **87**: No. 18, 3415-3419(1 Sep 1983). Contract AC02-79ER10425.

Rate constants are calculated for isotopic analogues of H + $H_2 \rightarrow H_2$ + H. The calculations are distinguished by (i) use of the most accurate potential energy surface available for any reaction, (ii) use of variational-transition-state theory, (iii) consistent inclusion of anharmonicity, and (iv) calculation of tunneling contributions by a three-dimensional quantum-mechanical analogue of the collinear semiclassical Marcus-Coltrin procedure. On the basis of previous comparisons of this kind of calculation to experimental data for five other isotopic analogues and to other theoretical calculations, we estimate the absolute accuracy of the calculations as approximately +- 50%, at least for 300 to 1000 K. 9 tables.

2938 **Molecular orbital study of $O_2$p adsorbed on titanium ions on oxide supports.** Tatsumi, K.; Shiotani, M.; Freed, J.H. (Cornell Univ., Ithaca, NY). *Journal of Physical Chemistry;* **87**: No. 18, 3425-3429(1 Sep 1983).

An extended Hueckel analysis of $O_2^-$ adsorbed on Ti ions on oxide supports is presented. The potential energy surface is obtained for deformations between the two limiting structures of the $O_2^-$ parallel to the surface and end-on. A stable conformation is found for the parallel form, consistent with recent ESR results, and there is a maximum in energy between the two limiting structures. The observed near equality of the ESR hyperfine splittings of the two O atoms is found to be consistent with a small tilting of the $O_2$ axis from the parallel conformation (i.e., $< 10^0$). A low barrier for planar rotation of $O_2^-$ about the axis perpendicular to the surface is also found, consistent with the small activation energy obtained from ESR line-shape analysis. The predicted g-tensor components allow unambiguous assignment of the ESR results, and a discussion is given on how variations in the extended Hueckel parameters improve agreement with experiment. 5 figures, 1 table.

2939 **In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes.** Melendres, C.A.; Rios, C.B.; Feng, X.; McMasters, R. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **87**: No. 18, 3526-3531(1 Sep 1983).

Raman spectra of iron phthalocyanine (FePc) and its tetrasulfonated derivative (FeTSPc) adsorbed on copper and gold electrodes have been observed in situ in 0.05 M $H_2SO_4$ solution. Results confirm our previous finding on the coordination of FePc to water molecules to solution. Evidence suggests that the iron phthalocyanines are probably oriented with their planes parallel to the electrode surface even in immersed electrodes. A decrease in intensity and broadening of some vibrational bands are observed on increasing cathodic polarization; these are attributed to a lifting of the degeneracy of the vibrational modes due to a change in symmetry of the adsorbed molecules brought about by polarization induced by the double-layer field. The effect of carbon on the Raman spectra is discussed. The iron phthalocyanines appear to be stable at potentials close to hydrogen evolution in the absence of oxygen. 8 figures.

2940 **Hydration of the $Nd^{3+}$ ion in neodymium chloride solutions determined by neutron diffraction.** Narten, A.H.; Hahn, R.L. (Oak Ridge National Lab., TN). *Journal of Physical Chemistry;* **87**: No. 17, 3193-3197(18 Aug 1983). Contract W-7405-ENG-26.

Information on the hydration of the neodymium ($Nd^{3+}$) ion has been obtained directly and unambiguously by neutron diffraction. Measurements were made with solutions of neodymium chlo-

ride ($NdCl_3$) in heavy water ($D_2O$), identical in every respect except for the isotopic state of the $Nd^{3+}$ ions. These experiments yield in a straightforward manner the distribution of oxygen and deuterium atoms of the water molecules in the first hydration sphere of the $Nd^{3+}$ ion. Each ion is surrounded by 8.6 oxygen atoms at a distance of 2.48 A and 16.7 deuterium atoms at 3.13 A, indicating a well-defined hydration sphere of 8.5 +- 0.2 water molecules, with the deuterium atoms pointing away from the cation. 5 figures, 5 tables.

**2941 Comparison of experimental values of anti V°Z, anti C/sub P/°$_2$, and anti C/sub V/°$_2$ for aqueous NaCl with predictions using the born equation at temperatures from 300 to 573.15 K at 17.7 MPa.** Wood, R.H. (Univ. of Delaware, Newark); Smith-Magowan, D.; Pitzer, K.S.; Rogers, P.S.Z. *Journal of Physical Chemistry;* **87**: No. 17, 3297-3300(18 Aug 1983). Contrat AC03-76SF00098.

Experimental values of anti V (molal volume)°$_2$, (∂anti V°$_2$/∂T)/sub p/ (change in molal volume with respect to temperature at constant pressure) and anti C/sub p/°$_2$ (partial molal heat capacity at constant pressure) are used to calculate anti C/sub V/°$_2$ (partial model heat capacity at constant volume) for aqueous NaCl at infinite dilution and 17.7 MPa over the temperature range 300 to 573K. The values of anti V°$_2$, anti C/sub P/°$_2$, and anti C/sub V/°$_2$ have been compared with calculations using the Born equation for 1 mol of hard-sphere ions of radius 0.327 nm. The Born equation gives reasonably accurate results with a single, adjustable radius for both volumetric and heat capacity effects, provided electrostatic effects are large compared to chemical effects. Large electrostatic effects are observed near the critical temperature and pressure. The experimental results for anti C/sub V/°$_2$ up to 573 K show a small temperature dependence in contrast to the large temperature dependence of anti C/sub p/°$_2$. The Born equation agrees with these results. The cause for the large difference between anti C/sub p/°$_2$ and anti C/sub V/°$_2$ is the large electrostrictive effect of the ions on the volume of the solution at these temperatures.

**2942 Iron and molybdenum extended X-ray absorption fine structure studies of double-cubane clusters containing $MoFe_3S_4$ cores.** Antonio, M.R. (Michigan State Univ., East Lansing); Teo, B.K.; Cleland, W.E.; Averill, B.A. *Journal of the American Chemical Society;* **105**: No. 11, 3477-3484(11 Jun 1983).

The Mo and Fe K-edge extended X-ray absorption fine structure (EXAFS) of $(Bu_4N)_3[Mo_2Fe_6S_8(SEt)_8]$ (1) $(Et_4N)_3[Mo_2Fe_6S_8(SEt)_8]$ (2), and $(Et_3NCH_2Ph)_3[Mo_2Fe_6S_8(SEt)_3(OPh)_3]$ (3) have been measured (in transmission mode) and analyzed. These clusters are known (1 and 2) or believed (3) to have the so-called double-cubane structures with two $MoFe_3S_4$ cubes. The interatomic distances, determined by curve fitting with theoretical phase and amplitude functions, agree well with crystallographic results. Using 1 (whose structure is most accurately known) as the model, the number of atoms neighboring the Mo and the Fe atoms can be determined to a satisfactory degree for the crystallographically disordered 2 and the structurally yet unknown 3. Curve fitting of the Mo EXAFS with a two-term expression yields average Mo-S (sulfide) and Mo-Fe distances and coordination numbers, whereas curve fitting with a three-term expression yields average Mo-S (sulfide), Mo-S′ (thiolate), and Mo-Fe distances and coordination numbers. The original Mo EXAFS spectrum of 2 reported in the literature has been shown to be due to an approximately equimolar mixture of 1 and 2. The Fourier transforms of the Fe EXAFS of 1 and 2 exhibit only one peak, due to Fe-S backscattering, whereas the corresponding transform of 3 shows only two peaks, due to Fe-O and Fe-S backscatterings. The unexpected finding of the absence of backscattering due to neighboring Fe and Mo atoms is explained in terms of cancellation of the Fe-Fe and Fe-Mo waves. The apparent lack of metal-metal peak in the Fourier transforms of the Fe EXAFS of 1-3 makes these clusters inadequate as models for the Fe EXAFS of the FeMo cofactor.

**2943 Homogeneous hydrogenolysis of carbon disulfide catalyzed by a molybdenum dimer with sulfido ligands.** DuBois, M.R. (Univ. of Colorado, Boulder). *Journal of the American Chemical Society;* **105**: No. 11, 3710-3711(11 Jun 1983).

In order to determine whether synthetic molybdenum complexes have value as potential models for commercial catalysts, an investigation of the homogeneous hydrodesulfurization activity of these complexes has begun. A hydrogenolysis of carbon-sulfur bonds that is catalyzed by the Mo(IV) dimer $(CH_3C_6H_4MoS)_2$ $S_2CH_2$(I) is reported upon.

**2944 Calculations on spin-paired species in metal-ammonia solutions.** Kestner, N.R.; Rao, B.K.; Finley, C.W. (Louisana State Univ., Baton Rouge). *Journal of Physical Chemistry;* **87**: No. 8, 1464-1466(14 Apr 1983). Contract AS05-77ER05399.

In this paper we show that the spin-paired species in ammonia is consistent with a cluster of two single-electron ammoniated cavity species held together by a cation, also probably solvated. With the electronic part of the wave functions for the ammoniated electron as determined by Newton, the ground-state electronic configuration is a singlet and the singlet-triplet separation is calculated to be about 0.1 eV. The spectrum of the individual cavity species is only shifted by a few hundredths of an electronvolt based on perturbation calculations. These data are consistent with the experimental values recently found by Schindewolf and Werner, who have other data which support the particular species studied in this paper.

**2945 Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$.** Kubas, G.J.; Jarvinen, G.D.; Ryan, R.R. (Univ. of California, Los Alamos, NM). *Journal of the American Chemical Society;* **105**: No. 7, 1883-1891(6 Apr 1983).

New complexes, mer,trans-$M(CO)_3(PR_3)_2(SO_2)$ (M = Mo,W; R = Ph,Cy,i-Pr) (I), cis,trans-$Mo(CO)_2$-$(PPh_3)_2(SO_2)$(L) (L = NCMe,py,CNCy,CN-t-Bu and CN(p-tolyl))(II), and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, have been prepared and characterized by infrared spectroscopy, $^{17}O$ and $^{31}P$ NMR spectroscopy, and X-ray crystallography. Syntheses for fac-$Mo(CO)_3(n^2\text{-}SO_2)$(LL) (LL = dppe,bpy,phen,2 py) have also been developed. Depending upon L, II has been found to coordinate $SO_2$ either in the S-bonded ($n^1$ planar) or O,S-bonded ($n^2$) geometries. Remarkably, for L = CNCy or CN-t-Bu, II has been found to contain, in the solid state, an apparent equimixture of both coordination types. Isomerization of fac-$M(CO)_3(dppe)(n^2\text{-}SO_2)$ (M=Mo,w; dppe = 1,2-bis(diphenylphosphino)ethane) to an $n^1$-planar $SO_2$ form, mer-$M(CO)_3(dppe)(SO_2)$, has also been found to occur. Thus, control of the $SO_2$ coordination geometry has been achieved by varying either the electronic properties of the ancillary ligands or their disposition with respect to the $SO_2$. The X-ray crystal structure of mer,trans-$Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ revealed $n^1$-planar $SO_2$ binding, the first example of this geometry for group 6 metals. The M-S distance, 2.239 (3) angstrom, is the longest such distance for this geometry recorded to date. Crystal data: Pbca, Z=8, a=24.712(8) angstrom, b=16.033(6) angstrom, c=14.058(5) angstrom, R=0.079 for 2934 reflections with $I \geq 2\sigma(I)$. The structure of $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$ showed a novel $SO_2$ bridging geometry in which all three atoms of $SO_2$ are metal coordinated. Crystal data: P1, Z=1, a=14.883(4) angstrom, b=9.264(2) angstrom, c=10.808(2) angstrom, R=0.039 for 3282 reflections with $I \geq 2\sigma(I)$.

**2946 An x-ray absorption study of the binuclear iron center in deoxyhemerythrin.** Elam, W.T. (Univ. of Washington, Seattle); Stern, E.A.; McCallum, J.D.; Sanders-Loehr, J. *Journal of the American Chemical Society;* **105**: No. 7, 1919-1923(6 Apr 1983).

New EXAFS data at 80 K obtained on deoxyhemerythrin in solution reveal an iron-peak at a separation of 3.13 +/- 0.03 angstrom. A repeat of measurements at 300 K shows the iron-iron peak greatly reduced, confirming the hyopthesis of increased relative thermal motion of the two iron atoms from the loss of the μ-oxo bridge. The signal from the first shell of ligands around the iron atoms was analyzed by using a difference spectrum vs. oxyhemerythrin, since rearrangements were expected in only a few ligands. The results of this analysis show that the nine ligands between the

irons and the protein remain unchanged, the bound dioxygen is replaced by hydroxide, and the short bond to the bridging oxygen is broken, leaving it bound to one iron. Thus, one iron becomes five-coordinate while the other remans six-coordinate. Details of this analysis are given and the resuts discussed in light of the information available form other sources.

2947 **Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters.** Maverick, A.W.; Najdzioneck, J.S.; MacKenzie, D.; Nocera, D.G.; Gray, H.B. (California Inst of Tech., Pasadena). *Journal of the American Chemical Society;* **105**: No. 7, 1878-1882(6 Apr 1983). Contract FG03-76ER10058.

The cluster ions $Mo_6Cl_{14}^{2-}$, $Mo_6Br_{14}^{2-}$, and $W_6Cl_{14}^{2-}$ are luminescent, with emission maxima (lifetimes, quantum yields) of 805 (180, 0.19), 825 (130, 0.23), and 880 nm (2 μs, 0.02), respectively, in acetonitrile at room temperature. Absorption spectra at low temperature reveal weak shoulders at low energy ($Mo_6Cl_{14}^{2-}$, 530 and 590 nm; $Mo_6Br_{14}^{2-}$, 600 nm; and $W_6Cl_{14}^{2-}$, 490 and 550 nm) that may be electronically closely related to the luminescences. Solid $(Bu_4N)_2Mo_6Cl_{14}$ is rigorously diamagnetic, and the paramagnetic $Mo_6Cl_{14}^{-}$ ion formed from it by one-electron oxidation gives an axial EPR spectrum (g/sub perpendicular/ = 2.10; g/sub parallel = 2.0). All three ions undergo facile electrochemical oxidation, at potentials of 1.60, 1.38, and 1.14 V, respectively, vs. SCE in $CH_3CN$. Kinetics and rate constants are discussed for electron-transfer quenching of the luminescent excited state $Mo_6Cl_{14}^{2-*}$ by several electron acceptors, both in aqueous and monaqueous solutions, and for the subsequent electron-transfer reactions.

2948 **$^{13}C$ CP/MAS NMR study of molecular motion in n-alkylsilanes bonded to the silica surface.** Sindorf, D.W.; Maciel, G.E. (Colorado State Univ., Fort Collins). *Journal of the American Chemical Society;* **105**: No. 7, 1848-1851(6 Apr 1983).

Motional dynamics in long-chain aliphatic phases bonded to silica gel were studied using CP/MAS $^{13}C$ relaxation measurements. Differences in cross-polarization rates and proton T/sub 1p/ and $T_1$ values observed for samples prepared by silylation of silica gel with dimethyloctadecylchlorosilane (DMODCS) and dimethyloctylchlorosilane (DMOCS) identified methyl group rotation as a likely principal source of proton spin-lattice relaxation. Cross-polarization rates for carbons located at equidistant positions from the surface-attached silicon atom were similar for DMODCS and DMOCS systems. In general, cross-polarization efficiency was observed to decrease with increasing distance from the surface along the alkyl chain. However, for distances greater than roughly eight carbon units cross-polarization rates are essentially the same.

2949 **Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+{}^{35}Cl$.** Garrett, B.C.; Truhlar, D.G.; Wagner, A.F.; Dunning, T.H. Jr. (Chemical Dynamics Corporation, Columbus, Ohio 43220). *Journal of Chemical Physics;* **78**: No. 7, 4400-4413(1 Apr 1983).

Ab initio POL—CI calculations, augmented by a dispersion term, are used to predict the potential energy surface for the reaction Cl+HCl. The saddle point is found to be nonlinear. The surface is represented by a rotated-Morse-oscillator spline fit for collinear geometries plus an analytic bend potential. Variational transition state theory calculations, based on a linear reference path, are carried out, and they yield much smaller rate constants than conventional transition state theory, confirming that earlier similar results for this heavy—light—heavy mass combination were consequences of the small skew angle and were not artifacts of the more approximate potential energy surfaces used in those studies. Transmission coefficients are calculated using approximations valid for large-reaction-path curvature and the potential along the reference path is scaled so that the calculated rate constant agrees with experiment. The resulting surface is used to compute the H/D kinetic isotope effect which is in qualitative agreement with experiment.

2950 **Perturbation theories for the dipolar fluids.** Lee, L.L.; Chung, T.H. (The School of Chemical Engineering and Materials Science, The University of Oklahoma, Norman, Oklahoma 73019). *Journal of Chemical Physics;* **78**: No. 7, 4712-4720(1 Apr 1983).

We derive here four different perturbation equations for the calculation of the angular pair correlation functions of dipolar fluids; namely, the first order y-expansion, the modified Percus—Yevik (MPY) expansion, the modified hypernetted chain (MHNC) expansion, and the modified linearized hypernetted chain (MLHNC) equation. Both the method of the functional expansion and the method of the cluster integrals are utilized. Comparison with other perturbation theories (e.g., the Melnyk—Smith equation) is made. While none of the theories is exact, as shown by the cluster diagrams, the MLHNC and the MHNC contain more diagrams than, say, the MPY and y-expansion. The y-expansion equation can be improved by including the correction terms to the Kirkwood superposition approximation for the triplet correlation function. For example, the inclusion of the correction term rho∫d4h(14)h(24)h(34) in a formula given by Henderson, is shown to improve substantially the y-expansion equation. We examine the performance of two of the theories: the y-expansion and the MLHNC equation for a Stockmayer (dipolar) fluid with a reduced dipole moment μ/sup asterisk2/ $[ = \mu^2/(\epsilon\sigma^3)] = 1.0$. Comparison with Monte Carlo simulation results of Adams et al. and with other theories (e.g., the QHNC equation) shows that our results are reasonable. Further improvements of the equations are also pointed out.

2951 **In situ laser Raman spectroscopy of the sulfiding of $Mo/\gamma\text{-}Al_2O_3$ catalysts.** Schrader, G.L. (Ames Lab., IA); Cheng, C.P. *Journal of Catalysis;* **80**: No. 2, 369-385(Apr 1983).

Raman spectra of sulfided $Mo/\gamma\text{-}Al_2O_3$ catalysts were obtained using in situ techniques for two sulfiding methods. For samples sulfided by 10% $H_2S/H_2$ at 400°C, $MoS_2$ structures were observed. A stepwise sulfiding using 10% $H_2S/H_2$, with spectra recorded at 150, 250, and 350°C, resulted in observation of molybdenum oxysulfide, reduced molybdate, and surface "$MoS_2$" phases. Reexposure of these samples to air led to radical modification of the oxysulfide structures as well as transformation of some sulfide phases. A model incorporating terminal and bridging Mo-S bonding and anion vacancies is proposed. This model is based on the conversion of isolated and aggregated molybdate and $MoO_3$ species to oxysulfide and reduced molybdenum phases. Conversion of reduced molybdenum phases to sulfides is observed to be slow.

2952 **Catalyst size distributions from x-ray diffraction.** Pielaszek, J.; Cohen, J.B.; Burwell, R.L. Jr.; Butt, J.B. (Northwestern Univ., Evanston, IL). *Journal of Catalysis;* **80**: No. 2, 479-481(Apr 1983). Contract AC02-77ER04254.

Both the average metal crystallite size and the size distribution can be obtained from Fourier analysis of X-ray diffraction peaks from supported metal catalysts. The average size is obtained from the first derivative of the cosine coefficients (after correction for instrumental effects and microstrain), and the distribution from the second derivative. The advantage of this procedure over, say, electron microscopy is the good sampling associated with a large cross-section of X-ray beam. Furthermore, the weighting of the distribution determining the average size is the same as for chemisorption, so that direct comparisons are possible, $<L^3>/<L^2>$ where L is the size.

2953 **Direct free-hole absorption induced in germanium by 1.06 μm picosecond pulses.** James, R. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **19**: No. 4, 701-710(Apr 1983). Contract W-7405-ENG-26.

The intervalence-band absorption coefficient in germanium is calculated as a function of the hole density and temperature for light with a wavelength of 1.06 μm. At this wavelength, the direct free-hole transitions in germanium occur between the heavy- and split-off hole bands, and between the light- and split-off hole bands. This absorption mechanism is normally negligible compared to the

interband absorption; however, for a sufficiently dense electron-hole plasma, the freehole intervalence-band absorption can become comparable to the interband absorption. Furthermore, the interaction of the intense 1.06 μm light alters the distribution of resonantly coupled hole states, and leads to an intensity dependence in the intervalence-band absorption cross section. For a fixed hole density, the intervalence-band cross sections due to free-hole transitions between the heavy- and split-off hole bands and between the light- and split-off hole bands are found to decrease with increasing intensity in a manner closely approximated by an inhomogeneously broadened two-level model. Values for the saturation intensity of each resonant transition are calculated as a function of the hole density and temperature. The intensities required to begin to saturate the direct free-hole transitions are easily attainable using picosecond pulses.

2954 **$^{29}$Si NMR study of dehydrated/rehydrated silica gel using cross polarization and magic-angle spinning.** Sindorf, D.W.; Maciel, G.E. (Colorado State Univ., Fort Collins). *Journal of the American Chemical Society;* **105**: No. 6, 1487-1493(23 Mar 1983).

A $^{29}$Si NMR study was carried out on silica gel, using cross polarization and magic-angle spinning (CP/MAS). Spectra were examined on silica samples prepared at various stages of dehydration. It was found that the spectral changes observed in these experiments could not be accounted for by a single structural model of the types that have been advanced previously for silica surfaces. However, these $^{29}$Si spectral features are consistent with a heterogeneous silica surface consisting of separate regions resembling the 100 face and 111 face of β-cristobalite.

2955 **Kinetics of the Cl—$H_2$ system. II. Abstraction vs exchange in D+HCl.** Miller, J.C.; Gordon, R.J. (Department of Chemistry, University of Illinois at Chicago, Chicago, Illinois 60680). *Journal of Chemical Physics;* **78**: No. 6, 3713-3720(15 Mar 1983).

The gas phase reaction of D with HCl was studied at room temperature by the method of flash photolysis, with resonance fluorescence detection of D, H, and Cl atoms. The D and Cl atoms were observed to decay exponentially, whereas no H atom signal from the exchange reaction was detectable. From the calibrated sensitivity of the H atom detector, an upper limit of 0.002 was set for the ratio of rate constants for the exchange vs abstraction channels.

2956 **Analysis of periodic perturbations of limit cycles.** Rehmus, P.; Ross, J. (Department of Chemistry, Stanford University, Stanford, California 94305). *Journal of Chemical Physics;* **78**: No. 6, 3747-3755(15 Mar 1983).

An algorithm due to Loud is used to find asymptotically convergent series solutions for limit cycles subjected to weak periodic perturbations. If an exact or approximate solution to the unperturbed limit cycle is available near or far from marginal stability, then accurate predictions can be made for entrainment bands and the phase relationships between the various oscillatory chemical species and the perturbation. The utility of this method is shown for several model systems. In an appendix, the appearance and character of critical slowing down at the edges of entrainment bands is demonstrated.

2957 **Ab initio study of electronic coupling in the aqueous $Fe^{2+}$—$Fe^{3+}$ electron exchange process.** Logan, J.; Newton, M.D. (Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* **78**: No. 6, 4086-4091(15 Mar 1983).

Electronic Hamiltonian matrix elements between initial and final zeroth order states associated with electron exchange in the hexa-aquo $Fe^{2+}/Fe^{3+}$ redox system have been calculated in terms of self-consistent field (SCF) ab initio wave functions. The face-to-face and apex-to-apex approach geometries of the quasioctahedral reactants have been modeled, respectively, by the $[Fe(H_2O)_3$—$Fe(H_2O)_3]^{5+}$ cluster ($S_6$ symmetry) and the $[Fe(H_2O)$—$Fe(H_2O)]^{5+}$ cluster (D/sub 2h/ symmetry). For the latter cluster, the Condon approximation has been tested and found to be accurate to within ~1 $cm^{-1}$ for the important range of inner-shell FeO distances. The calculations employ ab initio effective core potentials for inner-shell electrons and explicitly include all metal and ligand valence electrons. Due to weak 3d—3d overlap, the energy-preferred SCF solutions are charge localized (i.e., symmetry broken: $S_6 \rightarrow C_3$ and D/sub 2h/→C/sub 2v/). The present results for the interpenetrating face-to-face approach geometry are quite similar to earlier results based on a crystal-field model, implying an electronic transmission factor $\langle\kappa\rangle$ of ~1/5 at the most probable reactive encounter separation (5.3 A). The alternative apex-to-apex approach geometry is found to be less kinetically favorable. Attempts to fit calculated values of the electronic matrix elements to functions of the form P/sub n/(r)r/sup m/ exp(-αr) for the range r~5—8 A, where r is the FexxxFe separation in A and P/sub n/(r) is a polynominal, yield values of α ranging from 0.8 to 2.4 $A^{-1}$, depending on the values of n and m, the orientation of reactants, and the model employed for the ligands. The calculated matrix elements are found to be rather insensitive with respect to variation of certain features of the SCF wave functions.

2958 **Isotope enrichment during the formation of water clusters in supersonic free jet expansions.** Kay, B.D.; Castleman, A.W. Jr. (Department of Chemistry and Chemical Physics Laboratory C.I.R.E.S., University of Colorado, Boulder, Colorado 80309). *Journal of Chemical Physics;* **78**: No. 6, 4297-4302(15 Mar 1983).

Presently, investigation of the dynamics, energetics, and structure of microscopic molecular clusters constitutes an active area of research in chemical physics. Herein the RRKM theory of primary isotope effects is extended to qualitatively predict isotope enrichment in water cluster formation. The theoretical model is verified experimentally by neutral free jet expansion modulated molecular beam mass spectrometry of mixed $(H_2O)$/sub m/$(D_2O)$/sub n/ clusters. The results further support the previously presented mechanism for neutral cluster growth in free jet expansions. The observed enrichment factors (~30%) suggest that techniques involving clustering may find practical applications in the area of isotope separation.

2959 **Improved parametrization of diatomics-in-molecules potential energy surface for $Na(3p\ ^2P)+H_2 \rightarrow Na(3s\ ^2S)+H_2$.** Blais, N.C.; Truhlar, D.G.; Garrett, B.C. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **78**: No. 6, 2956-2961(15 Mar 1983).

We report a new set of diatomics-in-molecules potential energy surfaces and electronically adiabatic couplings for the process $Na(3p\ ^2P) + H_2 \rightarrow Na(3s\ ^2S)+H_2$. The surfaces of our previous paper [D. G. Truhlar, J. W. Duff, N. C. Blais, J. C. Tully, and B. C. Garrett, J. Chem. Phys. 77, 764 (1982)] are improved by employing a new parametrization for the $^3\Sigma^+$ diabatic potential energy curves of NaH. The $^3\Sigma^+$ diabatic Hamiltonian matrix H/sup n/ is based on small-basis-set valence-bond calculations for H/sup n/$_{12}$, and the diagonal elements are adjusted to yield accurate $^3\Sigma^+$ adiabatic potential curves. The new surfaces are compared to the recent ab initio results obtained by the coupled-electron-pairs approximation [P. Botschwina, W. Meyer, I. V. Hertel, and W. Reiland, J. Chem. Phys. 75, 5438 (1981)], and the comparison indicates good agreement between the semiempirical and ab initio surfaces.

2960 **Microstructure of two-phase random media. II. The Mayer--Montroll and Kirkwood--Salsburg hierarchies.** Torquato, S.; Stell, G. (Department of Mechanical and Aerospace Engineering, North Carolina State University, Raleigh, North Carolina 27650GA Technologies Inc., San Diego, California 92121). *Journal of Chemical Physics;* **78**: No. 6, 3262-3272(15 Mar 1983).

It is shown that the Mayer—Montroll (MM) and Kirkwood—Salsburg (KS) hierarchies of equilibrium statistical mechanics for a binary mixture under certain limits become equations for the n-point matrix probability functions S/sub n/ associated with two-phase random media. The MM representation proves to be identical to the S/sub n/ expression derived by us in a previous paper, whereas the KS representation is different and new. These results are shown to illuminate our understanding of the S/sub n/ from both a physical and quantitative point of view. In particular rigorous upper and lower bounds on the S/sub n/ are obtained for

a two-phase medium formed so as to be in a state of thermal equilibrium. For such a medium consisting of impenetrable-sphere inclusions in a matrix, a new exact expression is also given for S/sub n/ in terms of a two-body probability distribution function rho/sub 2/ as well as new expressions for S/sub 3/ in terms of rho/sub 2/ and rho/sub 3/, a three-body distribution function. Physical insight into the nature of these results is given by extending some geometrical arguments originally put forth by Boltzmann.

2961 **Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution.** Walker, H.W.; Pearson, R.G.; Ford, P.C. (Univ. of California, Santa Barbara). *Journal of the American Chemical Society;* **105**: No. 5, 1179-1186(9 Mar 1983).

Reported are kinetics studies of the reaction of methoxide ion with several mononuclear and polynuclear carbonyl hydride complexes H/sub x/M/sub y/(CO)/sub z/ of the iron triad. Deprotonation of the hydrides to give the conjugate base anions occurs with moderate second-order rate constants ($\sim 10^1$-$10^4 M^{-1}s^{-1}$), considerably smaller than those of oxygen or nitrogen acids of comparable thermodynamic strength under similar conditions. The relative slowness of these reactions is interpreted in terms of possible electronic and structural rearrangements of substrate and solvent occurring as the result of the deprotonation. In addition the kinetics technique allows the measurement of the reverse reaction (protonation of the conjugate base by methanol) rate constants which are also comparatively small ($\sim 0.05$-$25 s^{-1}$). The ratio of the forward and reverse rates gives the equilibrium constants from which the pK/sub a/'s in methanol can be calculated. In several cases pK/sub a/'s were confirmed by buffer/indicator techniques. From these and other published data are drawn the conclusions that bridging hydrides are more acidic than terminal hydrides and that hydrides of the lighter metals are more acidic than those of homologous heavier metals. Furthermore, it is shown that the substituent effect of replacing CO of a cluster by a trimethyl phosphite is to decrease significantly the acidity of that cluster's hydrides.

2962 **ENDOR study of bis(acetylacetonato)copper(II) in solid solution.** Kirste, B.; van Willigen, H. (Univ. of Massachusetts, Boston). *Journal of Physical Chemistry;* **87**: No. 5, 781-788(3 Mar 1983). Contract AC02-81ER10911.

The bis(acetylacetonato)copper(II) ($Cu(acac)_2$) complex and its adducts with methanol and pyridine in frozen solution have been studied by using ENDOR and electron-nuclear-nuclear triple resonance (TRIPLE). The ENDOR spectra yield the values of the hyperfine tensors of the CH and $CH_3$ protons. Signs of the hyperfine components were determined with the aid of TRIPLE and computer simulations. Measurements of quadrupole splittings in $^2H$ ENDOR spectra of $Cu(acac\text{-}3\text{-}d)_2$ oriented in a frozen liquid crystal allowed the assignment of the in-plane CH couplings to specific molecular axes and also provided information on the alignment of the molecule in the nematic phase. It is shown that TRIPLE can be used to reduce a powder ENDOR spectrum to a single-crystal-type spectrum that can give semiquantitative information on the relative orientation of hyperfine tensor axes. The proton hyperfine interactions in $Cu(acac)_2$ are similar to those in $VO(acac)_2$, notwithstanding the difference in round-state orbital of the unpaired electron. Adduct formation does not have much effect on the hyperfine components of the CH and $CH_3$ protons. The ENDOR data indicate that methanol and pyridine bind in a vacant axial position.

2963 **All-electron relativistic calculations on AgH. An investigation of the Cowan-Griffin operator in a molecular species.** Martin, R.L. (Los Alamos National Lab., NM). *Journal of Physical Chemistry;* **87**: No. 5, 750-754(3 Mar 1983).

The Cowan-Griffin relativistic operator, which retains only the mass-velocity and one-electron Darwin terms of the Breit-Pauli Hamiltonian, has been shown to provide a remarkably good approximation to the more sophisticated Dirac-Hartree-Fock (DHF) approach for many atomic systems. In this paper, the result of applying the Cowan-Griffin operator in first order to a nonrelativistic self-consistent-field (SCF) wave function expanded in a basis of Gaussian functions is reported for Ag and AgH. Comparisons are made with previously reported numerical wave functions for Ag and with the recent Slater-type-orbital expansion of the DHF wave function for AgH reported by Lee and McLean. The results of the present method are in excellent agreement with the DHF work and suggest that the approach might provide an attractive alternative to the DHF approximation. Further support for the contention of Ziegler, Snijders, and Baerends that the relativistic bond length contraction in AgH is caused by the mass-velocity term, as opposed to an atomic orbital contraction, is also presented.

2964 **Infrared fluorescence: a versatile probe of state-selected chemical dynamics.** Leone, S.R. (National Bureau of Standards, Boulder, CO). *Accounts of Chemical Research;* **16**: No. 3, 88-95(Mar 1983).

Infrared fluorescence and chemiluminescence are shown to be versatile probes for a wide variety of chemical dynamics problems. Examples given, range from the simplest possible breaking of a molecular bond, called photofragmentation dynamics, to the complexities of laser-initiated chemical chain reactions. Other examples cover the subtle competition between reactive and inelastic collision events, intramolecular randomization, studies of ion-molecule reaction dynamics, and surface reaction phenomena. In many cases the application of state-resolved infrared fluorescence provides powerful new insights into important remaining problems in chemical dynamics. Work thus far has provided several conceptually new ways of thinking about reaction dynamics and energy transfer.

2965 **Reaction of nitrite ion with hydroxylamine-N-sulfonate in aqueous solution.** Oblath, S.B.; Markowitz, S.S.; Novakov, T.; Chang, S.G. (Univ of California, Berkeley). *Inorganic Chemistry;* **22**: No. 4, 579-583(16 Feb 1983). Contract AC03-76SF00098.

The reaction between nitrite ion and hydroxylamine-N-sulfonate (HAMS) has been investigated in aqueous solutions; nitrous oxide and sulfate ions are the major products. The reaction kinetics exhibit first-order dependence on nitrite ion, second-order dependence on hydrogen ion in the pH region of 4-5, and between zero- and first-order dependence on HAMS, depending on the concentration. An activation energy of 30 kJ/mol was determined for the reaction in the temperature range of 10-40°C. The ionic strength dependence was studied in the range of 0.2-1.5 M. Oxalate, tartrate, and phthalate buffer systems were found to enhance the rate of reaction to varying degrees. An empirical rate law and the determined rate constants are reported. The results are examined in terms of a mechanism that consists of the nitrosation of HAMS, followed by a decomposition into products.

2966 **(DOE-tr—258) New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration.** Buvet, R.; Vallor, R.; Messina, R.; Gal, J.; Yu, L.T. (Solar Energy Research Inst., Golden, CO (USA)). 1983. Contract AC02-83CH10093. Translation of German Patent 2,625,443 1976. 18p. NTIS, PC A02/MF A01. Order Number DE84002813.

The redox or electron exchange polymers are products of mild oxidation in an acid medium of aromatic amines, e.g. aniline or pyrrole. These polymers may also be condensation products of a quinone derivative. The half-reduction potential of the polymers lies between 50 and 750 mV relative to the normal hydrogen electrode, and the redox capacity is between 0.5 and 5 m Eq/g. An apparatus for the electrochemical regeneration of these polymers is described, as are examples of the use of these polymers to conduct oxidation-reduction reactions on various materials. (DLC)

2967 **Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100).** Tsai, M.C.; Muetterties, E.L. (Univ. of California, Berkeley). *Journal of Physical Chemistry;* **86**: No. 26, 5067-5071(23 Dec 1982).

The surface chemistry of benzene, toluene, cyclohexane, cyclohexene, and cyclohexadienes on Pt(100) is described. Benzene chemisorption was largely molecular although H-D exchange between chemisorbed $C_6H_6$ and $C_6D_6$ was observed at temperatures of 100°C and above. Toluene chemisorbed with bond breaking to give Pt-(100)-benzyl. This benzyl species ($C_6D_5CD_2$) underwent H-D exchange with chemisorbed hydrogen. Exchange was more

facile at the $CH_2$ site than at aromatic C-H sites. Cyclohexane, cyclohexene, and cyclohexadienes chemisorbed on Pt(100) to form benzene with the expected relative ease of dehydrogenation of cyclohexadienes ≧ cyclohexene > cyclohexane.

2968 **Cross-polarization/magic-angle-spinning silicon-29 nuclear magnetic resonance study of silica gel using trimethylsilane bonding as a probe of surface geometry and reactivity.** Sindorf, D.W.; Maciel, G.E. (Colorado State Univ., Fort Collins). *Journal of Physical Chemistry;* **86**: No. 26, 5208-5219(23 Dec 1982).

$^{29}$Si NMR experiments, using cross polarization (CP) and magic-angle spinning (MAS), were carried out on a variety of silica gels and the products of their trimethylsilylation reactions with the silylating agent, hexamethyldisilazane (HMDS). A methodology has been developed to provide quantitative relationships on structure and reactivity from the $^{29}$Si CP/MAS spectra. Geminal-hydroxyl silanol sites were found to be more reactive to HMDS than lone-hydroxyl silanol sites. Measured surface hydroxyl densities and trimethylsilane coverages are discussed in terms of structural models.

2969 **Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces.** Redondo, A.; Zeiri, Y.; Goddard, W.A. III. (Arthur Amos Noyes Laboratory of Chemical Physics, California Institute of Technology, Pasadena, California 91125). *Physical Review Letters;* **49**: No. 25, 1847-1850(20 Dec 1982). Contract AM03-76SF00767;AT03-80ER10608.

A theory of desorption of atoms and molecules from solid surfaces based on a classical stochastic diffusion formulation is presented. A simple rate expression is obtained which has the form R = ($\Omega_0/2\pi$)f(T)exp(-D/sub e//kT), where $\Omega_0$ is the surface-adsorbate vibrational frequency, f(T) = 1 for atoms, and for molecules f(T) depends on the parameters for the frustrated rotations at the surface. This theory has been applied to the desorption of both atoms and molecules and excellent agreement with experiment is obtained.

2970 **Structure of the binuclear iron center in hemerythrin by X-ray absorption spectroscopy.** Elam, W.T. (Univ. of Washington, Seattle); Stern, E.A.; McCallum, J.D.; Sanders-Loehr, J. *Journal of the American Chemical Society;* **104**: No. 23, 6369-6373(17 Nov 1982).

Iron K-edge X-ray absorption data, including the near-edge structure and the extended X-ray absorption fine structure (EXAFS), have been measured for the respiratory protein hemerythrin in the biologically active oxy and deoxy forms of hemerythrin as well as metazido- and methydroxohemerythrin. The active-site structure is found to be very similar in the oxy and met forms, but distinctly different in deoxyhemerythrin. The binuclear iron center in oxy- and methemerythrins contains a $\mu$-oxo bridge similar to $Fe_2O$-containing standard compounds. The EXAFS data for metazidohemerythrin indicate that the average iron environment consists of a total of five nitrogen and oxygen ligands at 2.15 +/- 0.05 angstrom, and a bridging oxygen at 1.80 +/- 0.08 angstrom, implying a bridging bond angle of 152 (+28/-13)°. Deoxyhemerythrin shows distinct changes in the first-shell EXAFS, and the iron-iron peak has disappeared, indicating loss of the $\mu$-oxo bridge upon reduction.

2971 **Nickel ions affect a highly specific 1,4-dehydrogenation of hydrocarbons in the gas phase: metallacycles are not involved.** Halle, L.F. (California Inst. of Tech., Pasadena); Houriet, R.; Kappes, M.M.; Staley, R.H.; Beauchamp, J.L. *Journal of the American Chemical Society;* **104**: No. 23, 6293-62972(17 Nov 1982).

Reactions of singly charged atomic nickel ions with several linear alkanes have been studied using an ion beam apparatus and ion cyclotron resonance spectroscopy (ICR). Results using deuterated compounds indicate that dehydrogenation is an important reaction which proceeds via a highly specific 1,4 process. ICR studies of the subsequent reactions of the $NiC_4H_8^+$ ion formed from dehydrogenation of n-butane with $Ni^+$ suggest that loss of $H_2$ occurs by oxidative addition to the internal carbon-carbon bond followed by a $\beta$-hydrogen transfer to the metal. This intermediate can then either reductively eliminate an alkane or abstract another $\beta$ hydrogen and eliminate $H_2$, forming what can be most simply described as a bisolefin complex. The major product from reaction of $Ni^+$ with cyclopentanone is $NiC_4H_8^+$, probably a metallacycle, which reacts quite differently from the corresponding ion formed by dehydrogenation of n-butane.

2972 **Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid.** Oie, T. (The Rockefeller Univ., Palo Alto, CA); Loew, G.H.; Burt, S.K.; Binkley, J.S.; MacElroy, R.D. *Journal of the American Chemical Society;* **104**: No. 23, 6169-61742(17 Nov 1982).

The S/sub N/2 reaction between ammonia and formic acid has been studied as a model reaction for peptide bond formation using the semiempirical MNDO and ab initio molecular orbital methods. Two reaction mechanisms have been examined, i.e., a stepwise and a concerted reaction. The stationary points of each reaction including intermediate and transition states have been identified and free energies have been calculated for all geometry optimized reaction species to determine the thermodynamics and kinetics of each reaction. The stepwise mechanism was found to be more favorable than the concerted one by both MNDO and ab initio calculations. However, the ab initio method predicts both mechanisms to be fairly competitive with free energies of activation of about 50 kcal/mol. Despite excellent agreement between both methods in the calculated entropies and thermal energies, the minimum basis set character of MNDO leads to values of free energy of activation much higher than those obtained by the ab initio method. The basis set dependence and effect of correlation of the computed ab initio results and the relative effects of polarization and correlation were also investigated by using a number of basis sets up to 6-31G** and estimates of correlation energy by Moller-Plesset perturbation theory up to fourth order. Correlation energy was found to ba a significant factor in the stabilization of transition states.

2973 **Sensitive, non-intrusive point diagnostic for atomic chlorine using coherent anti-Stokes Raman scattering.** Moore, D.S. (Los Alamos National Lab., NM). *Chemical Physics Letters;* **89**: No. 2, 131-134(11 Jun 1982).

Coherent anti-Stokes Raman spectroscopy is used to detect chlorine atoms produced by microwave discharge in flowing $Cl_2$/He mixtures. A detection limit of (4.5 +- 1.7) x $10^{15}$ chlorine atoms/cm$^3$ was established by titration with $Br_2$. Methods for improvement of the detection limit are discussed.

2974 **Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes.** Rosenblatt, G.M. (Los Alamos National Lab., NM). *ACS Symposium Series;* No. 188, 57-73(1982). Contract W-7405-ENG-48.

Pitzer's equations and available ion-pair parameters allow calculation of mean-ion activity coefficients $\gamma$/sub +- in complex, concentrated electrolyte solutions with an accuracy estimated to be better than + 25% in the range 25° to 55°C. The accuracy of calculated activity coefficients is limited to about the same degree by uncertainties in the estimated parameters and by simplifications introduced in the theory both to reduce the number of parameters to be estimated and to reflect the uncertainties of the estimates. Because activity coefficients are determined to quite an extent by the form of Pitzer's equations and are not extremely sensitive to the exact values of parameters, ion-pair parameters only have to be estimated within a reasonable range. Upon comparing Pitzer-theory calculations for typical scrubber and model solutions with the association-equilibrium, extended Debye-Hueckel code in current use for FGD systems, one sees differences which reflect the differences in concentration range and applicability to mixtures of the two approaches. Pitzer's formulation offers a satisfactory and desirable way to model strong electrolyte activity coefficients in concentrated and complex mixtures. When sufficient experimental data are available, one can make calculations which are considerably more accurate. Further efforts based upon the Pitzer equation approach should allow one to model reasonably accurately the complex thermodynamics occurring in flue-gas-desulfurization aqueous scrubbers.

2975 **Gaseous reduction of an alloy oxide.** Allender, J.S. (E.I. du Pont de Nemours Co. Inc., Aiken, SC); De Jonghe, L.C. *Journal of Materials Science;* **16**: 2171-2725(1981). Contract AC02-76CS32586.

$Ni(Al, Fe)_2O_4$ ceramic alloys were reduced by hydrogen gas at a pressure of 1 atm, and at temperatures between 450 and 800°C. The reaction rate was determined from the rate of advance of the porous metal product layer-unreduced oxide interface. A simple analysis was presented permitting assessment of both the interface reaction resistance and the gas transport resistant through the porous product scales. The reaction was under mixed control in all conditions studied. In a range of temperatures and reaction times, preferred grain-boundary attack was observed. The conditions under which this was observed depended strongly on the $Al^{3+}$ content of the ceramic alloy. $Al^{3+}$ also lowered the interface reaction rate and inhibited scale coarsening by formation of dispersed unreduced phases in the product scales.

2976 **Reactive-diffuse systems with Arrhenius kinetics: multiple solutions, ignition and extinction.** Kapila, A.K. (Rensselar Polytechnic Inst., Troy, NY); Matkowsky, B.J. *SIAM Journal on Applied Mathematics;* **36**: No. 2, 373-389(Apr 1979).

The steady reactive-diffusive problem for a nonisothermal porous pellet with first-order exothermic Arrhenius kinetics is studied. In the large activation energy limit, asymptotic solutions are derived for the cylindrical and slab geometries. Analytical expressions for the solution are given on all three branches of the S-curve which characterizes the response of the system. In particular, explicit formulae are obtained for the multiplicity bounds (ignition and extinction limits). Our leading-order asymptotic results are then compared with the results of numerical computations.

## 4003 Organic Chemistry

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2977 **(DOE/ER/10612—9) Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984.** Ishida, T. (State Univ. of New York, Stony Brook (USA). Dept. of Chemistry). 31 Oct 1983. Contract AC02-80ER10612. 91p. NTIS, PC A05/MF A01. Order Number DE84002436.

The vapor pressure isotope effects (VPIE) between $^{13}CH_2F_2$ and $^{12}CH_2F_2$ and one between $^{12}CD_2F_2$ have been measured between 150 and 250°K. The $^{13}C/^{12}C$ effect is inverse, and its magnitudes fall within a narrow difference between the $^{13}C/^{12}C$-VPIE of methyl fluoride and fluoroform. The (normal) D/H-VPIE, however, shows magnitudes which are significantly higher than the D/H-VPIE's of methyl fluoride and fluoroform. In preparation for VPIE measurements of liquid and solid ammonia, $^{14}NH_3$, $^{15}NH_3$, and $^{14}ND_3$ samples have been purified against water, $O_2$, $CH_4$, $N_2$, and CO by using a combination of sodium treatment, distillation, and preparative GC. Impurity levels of the purified specimen are below 5 ppM for all impurities. The $^{15}N$ fractionation column system based on the $NO/N_2O_3$ exchange, has been successfully operated under pressures up to 3 atm. The single stage separation factor ($\alpha$) linearly increases with pressure, from 1.006 at 1 atm to 1.029 at 2.7 atm at 15.5°C. The HETP slowly increases with decreasing concentration of +4 nitrogen which catalyzes the exchange reaction. However, the overall separation increases with pressure, from 1.5 at 1 atm to 4.0 at 2.7 atm. The closed-cycle product-reflexer for the Nitrox process, in which $Fe^{2+}/Fe^{3+}$ solution in sulfuric acid is circulated between a product refluxer and electrolytic $Fe^{2+}$ -regeneration cells, has been studied to determine the extent of loss of enriched nitrogen in the refluxing system. The second-order orthogonal approximation for the zero-point energy (ZPE) has been refined, and new approximation parameters have been obtained.

2978 **(NP—3770422) Investigations on heavy methal complexing by humin substances in estuaries.** Haekel, W. (Kiel Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 1982. 153p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83770422.

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For investigations the following methods were used: 1. ultrafiltraton, 2. gelchromatography and 3. inverse voltammetry which was varied to combine fast sweep anodic stipping voltammetry with a rotating glass carbon electrode. The distribution of the heavy metals Cd, Pb, Cu and Hg which influences the distribution of humin substances between suspended matters and dissolved phase differs strongly. The humin substances cannot be understood as a homogeneous substance class. High-molecular humin substances flocculate at higher salt contents in opposition to low-molecular ones. This flocculation occurs when river and sea water are mixed in an estuary. Passing over from the fresh water region of a river to the sea the single heavy metals behave as follows: Cd is conservative and forms no compexes with humin substances. Cu privileged is complexed by low-molecular humin substances. In natural river water the entire Cu is complexed but is displaced in the estuary region by an excess of salt ions. Pb and Hg are privileged complexed by high-molecular humin substances. Thus their enrichment in sediments can be explained. The development method of fast sweep inverse voltammetry with a rotating glass carbon electrode has been established and can be used as a routine method to determine copper complexation capacities of natural waters.

2979 **EXAFS and Moessbauer studies of iron neutralized Nafion ionomers.** Pan, H.K.; Yarusso, D.J.; Knapp, G.S.; Pineri, M.; Meagher, A.; Coey, J.M.D.; Cooper, S.L. (Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin 53706). *Journal of Chemical Physics;* **79**: No. 10, 4736-4745(15 Nov 1983).

X-ray absorption spectroscopy was used together with Moessbauer spectroscopy to study the chemical state and the microstructure of iron neutralized Nafion membranes. The cation oxidation state deduced from the x-ray absorption-near-edge structure (XANES) of the ionomers agrees with that deduced from the Moessbauer isomer shift. Extended x-ray absorption fine structure (EXAFS) results confirm the existence of $Fe(H_2O)_6^{2+}$ octahedra, with a Fe—O distance of 2.11 +- 0.01 A in hydrated ferrous ionomers. As water content decreases below 6 wt. %, both coordination number and distances determined from EXAFS are found to decrease. The hydrated ferric Nafion salt contains many isolated $Fe(H_2O)_6^{3+}$ complexes which convert to a ferric dimer in vacuum-dried ferric salts which has an isomer shift of 0.58 +- 0.02 mm/s relative to iron and a quadrupole splitting of 1.73 +- 0.04 mm/s at 80 K. The dimer is shown to be $[(H_2O)_5Fe—O—Fe—(H_2O)_5]^{4+}$, having an Fe—$H_2O$ distance of 2.05 +- 0.02 A and a rather short Fe—O distance of 1.77 +- 0.02 A. The Fe—O—Fe bond angle is 155 +- 20°.

2980 **Theoretical study of possible benzene dimerizations under high-pressure conditions.** Engelke, R.; Hay, P.J.; Kleier, D.A.; Wadt, W.R. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **79**: No. 9, 4367-4375(1 Nov 1983).

We offer a theoretical explanation of the rate processes observed macroscopically in materials composed of aromatic ring structures subjected to high pressure. Earlier workers have made qualitative suggestions that the origin of these processes may be due to interring pi bonding. By making quantum-mechanical calculations on a simple special case of such systems (i.e., two interacting benzene rings), we attempt to produce a quantitative microscopic foundation for the suggestions. We briefly review earlier experimental and theoretical work on the subject and thereby motivate the working hypotheses used in the calculations. The principal hypothesis is that by studying restricted parts of the two benzene-ring energy hypersurface, we can learn something about the pressure-induced rate process for all the arene structures. By use of the modified-neglect-of-diatomic-differential-overlap (MNDO) method and the generalized valence bond "perfect-pairing" (GVP—PP) method supplemented by configuration interaction, we found two metastable ground electronic state dimers of benzene; we suggest that one

of these is the source of the observed rate process seen in benzene at high pressure. Further, we suggest that analogous dimerizations are responsible for the rate processes seen in larger arene materials subjected to very high pressures. The detailed geometries and energies of both benzene dimers are given. Suggestions for experimentally testing whether the proposed explanation is correct are given.

2981 **Perturbed angular correlation studies of indium metalloporphyrin complexes.** Mullins, O.C.; Kaplan, M. (Department of Chemistry, Carnegie—Mellon University, Pittsburgh, Pennsylvania 15213). *Journal of Chemical Physics;* **79**: No. 9, 4475-4488(1 Nov 1983).

Electric field gradients (EFG) at the metal center were studied in seven chloroindium porphyrin complexes and in chloroindium phthalocyanine by the technique of perturbed angular correlation of gamma rays. These complexes were synthesized with the probe nucleus $^{111}In$ for use in polycrystalline and solution sources. The magnitudes of the EFGs of the metalloporphyrins span a wide range and are shown to correlate with the electron donating properties of the peripheral substituents. For the phthalocyanine complex the derived EFG is quite large in spite of the electron withdrawing properties of the phthalocyanine ring. The porphyrin complexes all exhibited appreciable distributions in the magnitudes of the EFGs, which may be correlated with the deformable nature of the porphyrin macrocycle in contrast to the relatively planar, inflexible structure of the phthalocyanine ring which showed no such spread. The PAC spectra of metalloporphyrins dissolved in organic solvents exhibited two attenuation components, whose parameters were consistent with porphyrin properties and provide evidence for metalloporphyrin aggregation.

2982 **Electron attachment to oxygen in supercritical hydrocarbon fluids.** Nishikawa, M.; Holroyd, R.A. (Department of Pure and Applied Sciences, University of Tokyo 3-8-1, Komaba, Meguro-ku, Tokyo 153, Japan). *Journal of Chemical Physics;* **79**: No. 8, 3754-3758(15 Oct 1983).

The rate of attachment of electrons to oxygen was studied in methane, ethane, and propane gas above the critical temperatures up to pressures of ~200 atm. For all three gases, the rate increases with density and levels off above $N = 3 \times 10^{21}$ molecules/cm$^3$. For ethane, there is little or no effect of temperature on the rate between 25 and 75 °C and the rate is independent of electric field (E) up to $E/N = 1.2 \times 10^{-18}$ V cm$^2$, but increases at higher values of E/N. To explain the results, it is suggested that the energetics of the attachment reaction change with density; i.e., the energy level of the electron in the media ($V_0$) and the polarization energy ($P^-$) of $O_2^-$ change with N. The rate of attachment increases with the energy term E/sub T/ = $V_0$-$P^-$ +E/sub k/, where E/sub k/ is the electron kinetic energy, similar to the way the attachment rate increases with electron kinetic energy in the dilute gas.

2983 **Efficient nonphotochemical hole burning of dye molecules in polymers.** Fearey, B.L.; Carter, T.P.; Small, G.J. (Ames Lab., IA). *Journal of Physical Chemistry;* **87**: No. 19, 3590-3592(15 Sep 1983). Contract W-7405-ENG-82.

The nonphotochemical hole burning of ionic dye molecules in poly(vinyl alcohol) and poly(acrylic acid) polymers is shown to be efficient. Hole-burned spectra exhibit extensive intramolecular vibronic satellite structure which yields accurate $S_1$ vibrational frequencies. Data are presented which demonstrate that hole filling produced by a secondary burn at a frequency substantially removed from the primary burn frequency is highly selective. The class of ionic dyes in hydrogen-bonded polymers shows promise for detailed studies targeted at a better understanding of disorder and its associated relaxation processes in polymers. 3 figures.

2984 **Formation of hydrogen atoms in pyrolysis of 2,2-dimethylpropane behind shock waves.** Bernfeld, D.; Skinner, G.B. (Wright State Univ., Dayton, OH). *Journal of Physical Chemistry;* **87**: No. 19, 3732-3735(15 Sep 1983). Contract AC02-76ER02944.

Dilute mixtures (5 to 20 ppM) of 2,2-dimethylpropane (neopentane) were pyrolyzed behind reflected shock waves at temperatures of 1140 to 1300 K and total pressures of 2 to 3 atm. Progress of the reaction was followed by analysis for H atoms using resonance absorption spectroscopy. Appearance of H atoms was a first-order process with respect to time, an Arrhenius equation for the appearance of H atoms, based on 61 experiments, being k/sub H/ = $2.65 \times 10^{17}$ exp(-86300/RT) s$^{-1}$, where the activation energy is in calories. Taking into account two minor side reactions, the first-order rate constant for the first step in neopentane pyrolysis, $(CH_3)_4C \rightarrow (CH_3)_3C. + CH_3$ (1) was found to be $k_1 = 1.7 \times 10^{17}$ exp(-84000/RT) s$^{-1}$ with an estimated uncertainty of a factor of 2 in k/sub H/ and $k_1$. 2 figures.

2985 **Reactions of bis(dimethylglyoximato)cobalt(II) complexes with tert-butyl hydroperoxide.** Espenson, J.H.; Melton, J.D. (Ames Lab., IA). *Inorganic Chemistry;* **22**: No. 19, 2779-2781(14 Sep 1983). Contract W-7405-ENG-82.

Results show that the change in products and stoichiometry between aqueous solutions and benzene solvents arises from the effect of solvent on the rate constant for Beta-scission of the first radical intermediate, $(C\text{-}H_3)_3CO$. In benzene, the rate of the reaction is so slow that hydrogen atom abstraction occurs instead, leading to a second oxygen-centered radical, $(CH_3)_3COO.$, and finally to the isolated product, (tert-butylperoxy)cobaloxime. The most extensive measurements were made by flash photolysis. Products were characterized by $^1H$ NMR. 1 figure.

2986 **Hydrocracking polycyclic hydrocarbons over a dual-functional zeolite (faujasite)-based catalyst.** Hynes, H.W. Jr.; Helmer, N.E.; Parcher, J.F. (Chemical Engineering Department, University of Wyoming, Laramie, Wyoming 82071). *Industrial and Engineering Chemistry Process Design and Development;* **22**: No. 3, 401-409(Jul 1983). Contract AC22-77ET10651.

Mixtures of two-, three-, and four-ring (naphthalene, phenanthrene, and pyrene) structures were hydrocracked over a nickel-tungsten sulfide ultrastable zeolite Y catalyst. The hydrocracking of tetralin and phenanthrene proceeds by elimination of butanes to form $C_6$ and $C_{10}$ hydrocarbons primarily. Isomerization of saturated six-member rings to methyl-substituted five-member rings is also prominent. The presence of 1-cyclohexyl-2-phenylethane in the products from phenanthrene hydrocracking suggests an alternative reaction path for the hydrocracking of structures containing adjacent saturated rings. Pyrene hydrocracking proceeds primarily by elimination of propane followed by butanes elimination, i.e., $C_{16} \rightarrow C_{13} \rightarrow C_{10} \rightarrow C_6$. The $C_{13}$ intermediates are mostly hydrogenated phenalenes. The zeolite-based catalyst was very active in hydrocracking pyrene (critical diameter = 9 A) and smaller molecules. The perhydropyrene component of the feed mixture was relatively inert, but it could not be established whether this was due to a molecular sleve effect or intrinsic chemical kinetics factors.

2987 **Energetics and structures of organosulfur ions: $CH_3SSCH_3^+$, $CH_3SS^+$, $C_2H_5S^+$, and $CH_2SH^+$.** Butler, J.J.; Baer, T.; Evans, S.A. Jr. (Univ. of North Carolina, Chapel Hill). *Journal of the American Chemical Society;* **105**: No. 11, 3451-3455(11 Jun 1983).

The photoionization of dimethyl disulfide ($CH_3SSCH_3$) yields seven fragment ions between 10.0 and 10.7 eV. Among these are $CH_3SS^+$ and $C_2H_5S^+$ whose respective measured heats of formation, $\Delta H/sub\ f/°_{298}$, of 891 and 803 kJ/mol are significantly lower than previously reported. The rate of parent ion dissociation between 10.6 and 10.9 eV forming $C_2H_5S^+$ and $H_2CS^+$ was measured by photoelectron photoion coincidence. Comparison of the experimental rates with statistically expected rates leads to the conclusion that the dimethyl disulfide ion, which is initially produced with a CSSC dihedral angle of 90°, rearranges to the more stable 180° dihedral angle geometry prior to dissociation. The statistical theory rates fit the measured rates when a 298 K heat of formation of 690 kJ/mol is assumed for the energy of the dimethyl disulfide ion in its lowest energy state. This is 87 kJ/mol lower than previously assumed on the basis of the adiabatic ionization energy. The dimethyl disulfide ion is, therefore, 154 kJ/mol more stable with a CSSC dihedral angle of 180° than with an angle of 90°.

2988 **Coordinately unsaturated clusters. A novel catalytic reaction.** Burch, R.R. (Univ. of California, Berkeley); Shusterman, A.J.; Muetterties, E.L.; Teller, R.G.; Williams, J.M. *Journal of the American Chemical Society;* **105**: No. 11, 3546-3556(11 Jun 1983).

The dinuclear rhodium hydride $\{(\mu\text{-H})Rh[P(O\text{-}i\text{-}C_3H_7)_3]_2\}_2$ is a catalyst precursor for stereoselective hydrogenation of dialkylalkynes and diarylalkynes to the corresponding trans-alkenes. Both $H_2$ and the alkyne compete for reaction with the dimer with the respective products being $(H)(\mu\text{-H})_2Rh_2[P(O\text{-}i\text{-}C_3H_7)_3]_4$ and $(\mu\text{-H})_2(\mu\text{-}n^2\text{-}RC_2R)Rh_2[P(O\text{-}i\text{-}C_3H_7)_3]_4$. The further reaction of the tetrahydride complex with alkyne and also the rearrangement of the $n^2$-alkyne complex yield a bridged vinyl derivative, $(\mu\text{-H})[\mu\text{-}n^2\text{-}RC{=}C(H)R]Rh_2[P(O\text{-}i\text{-}C_3H_7)_3]_4$, 3, which has a trans arrangement of alkyl or aryl groups as established by X-ray crystallographic studies. The rate-determining step in the catalytic cycle appears to be hydrogen addition to the vinyl derivative. Competitive with hydrogen addition to the vinyl derivative is diarylalkyne addition and insertion to give the mononuclear complex $[R(H)C{=}C(R)(R)C{=}CR]Rh[P)O\text{-}i\text{-}C_3H_7)_3]_2$, which was also defined by an X-ray crystallographic study. The latter is a catalyst precursor for alkyne hydrogenation to form cis-alkenes. Dynamic stereochemical features of the vinyl complexes in the solution state are described as well as intermolecular alkyne exchange between free alkyne and the vinyl complexes.

2989 **Substituent bulk effects on solvation.** Ehrenson, S. (Brookhaven National Lab., Upton, NY). *Journal of Organic Chemistry;* **48**: No. 11, 1884-1886(3 Jun 1983).

Prolate ellipsoidal cavity models appear able, within the context of Kirkwood-Westheimer solvation theory, to rationalize the lack of bulk effects observed on the acidities of $p\text{-}CH_2NR_3^+$-substituted benzoic acids. The crucial feature appears to be whether increased bulk can and does substantially increase the distances of the interacting sites from the solvent in all directions.

2990 **Theoretical study of the allyl radical: structure and vibrational analysis.** Takada, T.; Dupuis, M. (Univ. of California, Berkeley). *Journal of the American Chemical Society;* **105**: No. 7, 1713-1716(6 Apr 1983). Contract AC03-76SF00098.

The electronic structure of the allyl $CH_2CHCH_2$ and its vibrational spectrum have been calculated from ab initio multiconfiguration Hartee-Fock (MCHF) wave functions. While the Hartree-Fock (HF) model incorrectly predicts a nonsymmetric structure, the MCHF calculations indicate that the allyl radical has C/sub 2v/ symmetry in accord with ESR evidence. Harmonic vibrational frequencies of all the normal modes are reported for the allyl radical and various deuterium-substituted analogues. Most noteworthy are the out-of-plane bending mode frequencies calculated at 760-790 $cm^{-1}$ which are predicted to give rise to a very intense and characteristic band of the allyl radical.

2991 **Cyclic D/sub 6h/ hexaazabenzene--a relative minimum on the $N_6$ potential energy hypersurface.** Saxe, P.; Schaefer, H.F. III. (Univ of California, Berkeley). *Journal of the American Chemical Society;* **105**: No. 7, 1760-1764(6 Apr 1983). Contract AC03-76SF00098.

Volger has recently reported laboratory evidence for the formation of hexaazabenzene from photochemical elimination in cis-diazidobis(triphenylphosphorane)platinum(II). Previous theoretical studies have suggested that the D/sub 6h/ benzene-like structure is not a minimum on the $N_6$ potential energy hypersurface. Here the $N_6$ problem has been addressed at the self-consistent-field (SCF) level of theory using double-Zeta (DZ) and double-Zeta plus polarization (DZ+P) basis sets. The smaller basis set yields the prediction that the D/sub 6h/ structure is a transition state connecting two equivalent bond alternant $N_6$ equilibrium geometries. A second transition state for dissociation to three nitrogen molecules (which are energetically much lower than $N_6$) was also located. Contrary to previous theoretical work, hexaazabenzene is found to be a minimum at the highest completely consistent level of theory. The equilibrium geometry occurs for r/sub e/(N-N) = 1.288 angstrom, a bond distance suggesting that $N_6$ is a classic aromatic molecule. The transition state to $3N_2$ lies 10.3 kcal higher and has the planar, bond alternant structure, $r_1(N\text{-}N) = 1.178$ angstrom, $r_2(N\text{-}N) = 1.551$ angstrom. Harmonic vibrational frequencies for hexaazabenzene are predicted with both theoretical methods and demonstrate that the energy surface is very flat with respect to bond alternation B/sub 2u/ displacements. The inclusion of correlation effects lowers the barrier to $N_6$ dissociation when geometrical structures obtained at the SCF level of theory are assumed.

2992 **Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene.** Grover, J.R.; Brenner, D.M. (Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* **78**: No. 7, 4385-4399(1 Apr 1983).

Pronounced fluctuations have been observed in the cross section for the quenching of the fluorescence of the different members of the vibrational manifold belonging to the A $^1A_2$ state of thiophosgene. This phenomenon is reminiscent of fluctuations that occur for nuclear reactions in regions of high level density, and that can be interpreted in terms of reduced transition amplitudes that are approximately normally distributed. The analysis of the fluctuations gives an effective number of independent reaction channels; in general, the greater the number of channels, the narrower is the range of the fluctuations. A knowledge of the number of independently contributing channels can be useful in the interpretation of experimental results, and sometimes lends important insight into reaction processes. The quenching cross sections for thiophosgene were therefore examined to see whether an analysis of their fluctuations would be useful. It was found necessary to develop a form of analysis that circumvents a serious obstacle in the chemical data, namely, the existence of significant correlations among the cross sections. The resulting formalism is quite simple to apply however, and, after suitable generalization, should be widely applicable to chemical experiments in which resolved cross sections that exhibit fluctuations are measured. The analysis also reveals the existence of an important, experimentally determined constraint that must still be accounted for by any successful hypothesis, viz. the number of channels increases approximately as the square root of the peak power of the quenching infrared radiation.

2993 **Phases of insoluble monolayers: Comparison between the surface pressure-molecular area (Pi-A) diagram and shear modulus measurements.** Miyano, K.; Abraham, B.M.; Ketterson, J.B.; Xu, S.Q. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **78**: No. 7, 4776-4777(1 Apr 1983).

Simultaneous measurements of the surface pressure-molecular area (Pi-A) diagrams and the shear modulus of a series of long chain aliphatic alcohols $C_{18}OH$, $C_{20}OH$, $C_{21}OH$, and $C_{22}OH$ spread on water indicate that the conventional phase assignments based on the compressibility are not reliable.

2994 **Olefin addition in Fischer-Tropsch synthesis on an iron catalyst.** Satterfield, C.N.; Huff, G.A. Jr.; Summerhayes, R. (Massachusetts Inst. of Tech., Cambridge). *Journal of Catalysis;* **80**: No. 2, 486-489(Apr 1983). Contract FG22-81PC40771.

The possibility of altering the molecular weight distribution of Fischer-Tropsch products by addition of olefins to the synthesis gas is of practical interest. Two early studies with C-labeled ethylene or propylene indicated that on iron catalysts only a few percent of the added olefins were incorporated into higher hydrocarbons but in a more recent study it was reported that the addition of ethylene or propylene markedly shifted the selectivity to heavier products. This study was designed to help resolve this seeming disagreement.

2995 **Kinetic features of an intraresin reaction.** Kim, B.; Kirszensztejn, P.; Bolikal, D.; Regen, S.L. (Marquette Univ., Milwaukee, WI). *Journal of the American Chemical Society;* **105**: No. 6, 1567-1571(23 Mar 1983).

The kinetic features of the intraresin displacement by pendant ammonium acetate groups on chloromethylated polystrene have been investigated as a function of temperature, swelling solvent, and cross-link density. In all cases, intraresin displacement

proceeds with a rapid initial rate followed by a very slow stage; the latter represents that fraction of reactants which become "kinetically isolated". The free energy of activation for the first stage, under the various swelling conditions used, lies in the range 24.4-26.8 kcal $mol^{-1}$, which is similar to that found for analogous homogeneous reactions. The absolute rates measured for the homogeneous and the initial intraresin displacement in dioxane were similar; with n-hexane and toluene as solvents, polymeric rates were considerably slower than those of their homogeneous counterparts. Intraresin displacement was rapid even when a poor swelling solvent (n-hexane) was used. As the rate of intrapolymeric reaction decreased (through a decrease in temperature, increase in cross-link density, or change in solvent), the percent of "kinetical isolated" sites increased.

2996 **Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers.** Hoffman, M.R.; Yoshioka, Y.; Schaefer, H.F. III. (Univ. of California, Berkeley). *Journal of the American Chemical Society;* **105**: No. 5, 1084-1088(9 Mar 1983).

The molecular structures, vibrational frequencies, and relative energies of silaacetylene and its vinylidene and silyidene isomers have been investigated via nonempirical molecular electronic theoretical methods. Basis sets of double Zeta (DZ) and double-Zeta plus d function quality have been used for this purpose in conjunction with self-consistent-field (SCF) and configuration interaction (CI) wave functions. The largest CI included in a completely variational manner 8 001 configurations, and analytic CI gradient methods were used to determine the structure and harmonic vibrational frequencies of silaacetylene itself. The absolute minimum on the potential energy hypersurface is the silyidene, $:Si{=}{=}CH_2$, which lies ~50 kcal below the linear silaacetylene. The vinylidene isomer $H_2Si{=}{=}C:$ is either an extremely shallow minimum, or, more likely, not a genuine relative minimum at all. Silaacetylene is predicted to have a trans bent equilibrium geometry, with HSiC angle 128.8°, HCSi angle 150.1°, and a silicon-carbon bond distance of 1.635 A about 0.08 angstrom, about 0.08 angstrom shorter than a "standard" $Si{=}{=}C$ double-bond distance. The silicon-carbon stretching vibrational frequency is predicted to be ~ 1100 $cm^{-1}$, or 10% higher than found experimentally for dimethylsilaethylene. It is concluded that the silicon-carbon linkage in trans-bent silaacetylene is intermediate between a double and triple bond. There appears to be no cis isomer of silaacetylene.

2997 **Host-guest interactions in amylose inclusion complexes: photochemistry of surfactant stilbenes in helical cavities of amylose.** Hui, Y.; Russell, J.C.; Whitten, D.G. (Univ. of North Carolina, Chapel Hill). *Journal of the American Chemical Society;* **105**: No. 5, 1374-1376(9 Mar 1983). Contract AS05-81ER10815.

A series of substituted stilbenes, S/sub n/, in which the stilbene chromophore is incorporated into a surfactant molecule, has been synthesized. It has been found that these stilbenes are sensitive structural probes for organized media. The behavior of three of the surfactant stiblenes in the presence of amylose in aqueous dimethyl sulfoxide is described. The results reveal several interesting features of amylose host-guest interaction, including a clear indication that, at least for the stilbenes, the guest is held in a reasonably constrained site similar to that provided by various bilayer structures.

2998 **Aggregation of the bacteriochlorophylls c, d, and e. Models for the antenna chlorophylls of green and brown photosynthetic bacteria.** Smith, K.M.; Kehres, L.A. (Univ. of California, Davis). *Journal of the American Chemical Society;* **105**: No. 5, 1387-1389(9 Mar 1983). Contract AC02-76CH00016.

Aggregates of bacteriochlorophylls c, d, and e and of zinc(II) methyl bacteriopheophorbides c and d, which exhibit large red shifts in hexane without the essential intervention of any carbonyl function on ring V are described. The aggregates appear to provide viable in vitro models for the antenna chlorophylls of green and brown photosynthetic bacteria and a rationale for the presence of the 2-(1-hydroxyethyl) group in bacteriochlorophylls c, d, and e.

2999 **Interplay between geometry and mobility in intramicellar kinetics.** Hatlee, M.D. (Univ. of Notre Dame, IN); Kozak, J.J.; Graetzel, M. *Berichte der Bunsengesellschaft fuer Physikalische Chemie;* **86**: 157-161(1982).

The role of geometry in influencing reaction-diffusion processes in spherical versus rod-shaped micellar aggregates is studied. Previously-reported data on pyrene excimer-fluorescence in dodecylammonium chloride (DAC) micellar solutions is analyzed by applying a theory proposed by Adam and Delbrueck to account for timing effects associated with the reduction of dimensionality in diffusion-controlled processes. Our results show that the overall dynamics are governed by an interplay between the characterizing geometry of the host micellar aggregate and the mobility of the solubilized probe molecules in the assembly.

3000 **Use of spectral simulations for the assay of radical concentrations by ESR.** Zeldes, H.; Livingston, R. (Oak Ridge National Lab., TN). *Journal of Magnetic Resonance;* **49**: 84-92(1982). Contract W-7405-ENG-26.

ESR spectrometers are used to record the derivative of adsorption, and an assay of radical concentration in a solution is based upon the evaluation of A/sub ∞/ (the second integral of the spectrum for essentially infinite field limits). One approach for its evaluation is based on making an accurate computer simulation of an experimental spectrum so that the value of A/sub ∞/ may be computed from the parameters of the simulation. The simulation can be based on a Lorentzian line shape. The method essentially removes the problem of locating the position of the spectral baseline and provides a way to avoid corrections for finite integration limits and for contributions to A/sub ∞/ from lines outside the region integrated. The method becomes more attractive for spectra of low signal-to-noise ratio and especially for spectra of closely spaced components. Experiments with a stable reference free radical show that modulation effects may be suitably simulated and that values of A/sub ∞/ determined by the 2 methods are in agreement. A method is given for the correction of A/sub ∞/ for microwave power saturation. The simulation method is demonstrated by assay of benzyl radical with a weak spectrum of closely spaced components. 5 figures, 1 table.

3001 **Activity and selectivity studies on silica supported Fischer-Tropsch catalyst.** Arcuri, K.B. Evanston, IL; Northwestern Univ. (1982). 374p. University Microfilms Order No. 83-05,451.

Thesis (Ph. D.).

Fischer-Tropsch reaction studies are conducted over well characterized silica supported Fe, Co, and FeCo alloy catalyst at 250°C and total pressures of 1 to 14 atm. Low CO conversions (< 5%) are employed in order to minimize the complications of integral reaction systems. The reactant streams include 1/1 and 1/3 $CO/H_2$ mixtures in addition to a 1/3 $CO/H_2$ feed containing either 5.4 mole % $C_2H_4$ or 0.5 mole % 1-pentene. Specific CO activities are generally found to decrease with increasing CO conversion. No irreversible loss in activity is observed at the pressure and feed conditions employed. The Co catalyst possesses the highest specific CO activity at 1 atm; however the activity decreases by 50% as the pressure increases to 14 atm. For both iron containing catalysts the CO activity increases with increasing pressure such that the Fe Catalyst possesses the highest activity while the FeCo catalyst yields activity comparable to that of pure Co. The alloy catalyst yields the smallest product fraction of long chain ($Cn > 4$) hydrocarbons while the Co catalyst produces the largest fraction. Methanol becomes a dominant product at elevated pressures for the iron containing catalyst while long chain hydrocarbon products are produced with the Co catalyst. The presence of ethylene in the feed stream increases the product yields of the $Cn > 2$ hydrocarbon products but does not affect the growth probability. The presence of 1-pentene in the feed stream marginally enhances the $Cn \geq 6$ yields while not affecting the growth probability. Transient reaction studies imposed by a step change in the space velocity indicate that steady state hydrocarbon production occurs sequentially with increasing carbon chain length.

## 4004 Electrochemistry

*REFER ALSO TO CITATION(S) 2253, 2933, 2960, 2998*

**3002 Reversible sequential transfer of two electrons at the same potential in bis(1,3,5-triketonato)dicopper(II) complexes and their diamine Schiff bases. Effect of $Na^+$ and similar ions on the cyclic voltammetry.** Lintvedt, R.L.; Kramer, L.S. (Wayne State Univ., Detroit, MI). *Inorganic Chemistry;* **22**: No. 5, 796-802(2 Mar 1983).

The cyclic voltammetry of four binuclear Cu(II) 1,3,5-triketonates and their diamine Schiff-base derivatives has been investigated in DMF with $(C_2H_5)_4NClO_4$ as the supporting electrolyte. Addition of simple cations such as $Na^+$ to these solutions has a profound effect on the reduction potentials of the Cu(II) ions and on the stability of the reduced product. In the presence of a sufficient concentration of $Na^+$ ions, the complexes exhibit one CV wave due to the coppers with peak separations of 42-44 mV and cathodic half-peak widths of 42-44 mV also. These results may be obtaned with no instrumental iR compensation, providing a high concentration of the supporting electrolyte is present. The process is reversible with use of the criteria of scan rate dependence of the cathodic peak current and width and the equivalence of the cathodic and anodic peak heights. Controlled-potential electrolysis results prove that the process involves the transfer of two electrons. All of the experimental facts may be explained by the reversible, sequential transfer of two electrons at the same potential. Although the two Cu(II) ions in the diamine Schiff bases are in much different coordination environments within the same molecule, they give rise to the same CV wave shapes as the triketonates; i,e., ΔE/sub p/ and E/sub pc/ - E/sub p/$_{/2}$ both are very nearly 42 mV. Thus, they also undergo two-electron transfer at the same potential. The only significant difference between the simpler binuclear Cu(II) triketonates and the diamine Schiff-base derivatives is that $E_{1/2}$ values for the Schiff bases are about 0.1V more negative than for their triketonate analogues.

## 4005 Photochemistry

*REFER ALSO TO CITATION(S) 2067, 2253, 2922, 2923, 2929, 2933, 2967, 2977, 2979, 2981, 2993, 2994, 3103, 3411, 3557*

**3003 (AD-A—130666/1) Characterization and photochemistry of surface-confined mononuclear and trinuclear phosphine/carbonyl complexes of ruthenium(0). Interim technical report.** Liu, D.K.; Wrighton, M.S.; McKay, D.R.; Maciel, G.E. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry). 15 Jun 1983. 49p. (TR—38-ONR). NTIS, PC A03/MF A01.

The characterization and photochemistry of (SiO2)-LRu(CO)4 and (SiO2)-L3Ru3(CO)9 is reported where (SiO2)- represents high surface area (approx. 400 square meters/g) SiO2. Synthesis of the (SiO2)-LRu(CO)4 and (SiO2)-L3Ru3(CO)9 is effected by reaction of Ru(CO)4(PPh2CH2CH2Si(OEt)3) or Ru3(CO)9(PPh2CH2CH2Si(OEt)3)3 with a hydrocarbon suspension of (SiO2)-. Solid state 13C, (29)Si, and (31)p CP/MAS NMR, FTIR, uv-vis photoacoustic spectroscopy, and elemental analyses establish the nature of the functionalized (SiO2)-. Typical coverage of -LRu(CO)4 or -L3Ru3(CO)9 is approx. 10 to the the minus 10 - ten to the minus 11 mol/square meters. Photoexcitation (near-uv) of (SiO2)-LRu(CO)4 suspended in hydrocarbon media results in chemical reaction consistent with dissociative loss of CO to give a 16-valence electron, surface-confined species that reacts with 2-electron P-donors. The light-induced extrusion of CO can be effected and detected spectroscopically by chemical trapping in rigid media at low temperature (approx. 90 K). Near-uv irradiation of (SiO2)-LRu(CO)4 at 298 K exposed to a gas gives chemistry consistent with dissociative loss of CO, also. Complete (greater than 90%) exchange of CO for (13)CO can be effected by irradiation under 1 atm (13)CO as monitored by FTIR/photoacoustic spectroscopy. The photochemistry of (SiO2)-LeRu3(CO)9 involves metal-metal bond rupture; under 1 atm CO in a solid/gas reaction or as a suspension in hydrocarbon solvent saturated with CO the (SiO2)-L3Ru3(CO)9 yields (SiO2)-(LRu(CO)4)3.

**3004 (AD-A—131300/6) Excited-state processes of relevance to photoelectrochemistry. Technical report.** Ellis, A.B. (Wisconsin Univ., Madison (USA). Dept. of Chemistry). 26 Jul 1983. 13p. NTIS, PC A02/MF A01.

The excited-state properties of semiconductor electrodes play a crucial role in photoelectrochemistry. Luminescence offers a means for characterizing the electronic structure and excited-state decay routes of semiconductors employed in PECs and underscores their relationship to electrochemistry: PL can be perturbed and EL initiated by charge-transfer events occuring at the semiconductor-electrolyte interface.

**3005 (DOE/ER/10755—3) State-to-state unimolecular reaction dynamics. Technical progress report.** (Wisconsin Univ., Madison (USA)). 1983. Contract AC02-80ER10755. 5p. NTIS, PC A02/MF A01. Order Number DE84003009.

Experimental studies of unimolecular reaction dynamics using direct excitation of overtone vibrations in combination with time-resolved spectroscopic product detection provide detailed data on unimolecular decomposition rates and energy disposal into the fragments of selectively excited molecules. We have constructed and tested a pulsed molecular beam apparatus for extending these measurements to cold molecules. We have also used laser induced fluorescence detection to measure the unimolecular decay rate in selectively excited t-butylhydroperoxide and to determine the product quantum states populated in the decomposition of hydrogen peroxide and its partially deuterated analogue.

**3006 (DOE/ER/10815—2) Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983.** Whitten, D.G. (North Carolina Univ., Chapel Hill (USA). Dept. of Chemistry). 1983. Contract AS05-81ER10815. 23p. NTIS, PC A02/MF A01. Order Number DE84002639.

Goal is to study light-driven electron transfer and hydrogen atom abstraction processes with emphasis on reactions giving rise to net chemical or electrochemical conversion. The original proposal focused on studies using substrates excitable with visible light - ranging from metal complexes, porphyrins and metalloporphyrins to dyes and ketones - and quencher-mediators capable of acting as electron donors or acceptors by virtue of having multiple closely spaced redox levels. During the past eighteen months results were obtained in five areas: generation and reaction of reducing and oxidizing radicals and radical ions in photoelectrochemical cells; studies of Weitz-type quenchers having stable one-electron redox products; two-electron oxidative and reductive quenching processes with Weitz-type systems in solution and organized media; photoredox reactions of indigo dyes; and modification of photochemical reactivity by formation of amylose inclusion complexes in aqueous and partially aqueous solutions.

**3007 (DOE/EV/03018—247) Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983.** McGlynn, S.P. (Louisiana State Univ., Baton Rouge (USA). Dept. of Chemistry). 15 Aug 1983. Contract AS05-76EV03018. 77p. NTIS, PC A05/MF A01. Order Number DE83017404.

Portions are illegible in microfiche products.

The individual reports cover Rydberg states of methyl iodide; photoacoustic spectra of azulene, halogens, and mixed-halogens; synthesis and characterization of metallodipyrromethenes; and electron/charge transfer in photochemical reactions of 9-phenylanthracene and perylene. (DLC)

**3008 Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals.** Chattopadhyay, S.K.; Das, P.K.; Hug, G.L. (Univ. of Notre Dame, IN). *Journal of the American Chemical Society;* **105**: No. 20, 6205-6210(5 Oct 1983).

Singlet and triplet quenching by two stable free radicals, viz., di-tert-butylnitroxy (DTBN) and 4-hydroxy-2,2,6,6-tetramethylpiperidinyl-1-oxy (HTMP), have been studied with three all-trans α,ω-diphenylpolyenes, Ph(t-C==C)/sub n/Ph, n = 2 to 4, as excited-state substrates in different solvents. Data are presented for

fluorescence quenching rate constants (0.8 to 2.1 x $10^{10}$ $M^{-1}$ $s^{-1}$ in cyclohexane/methanol), the fraction of singlet quenching events that result in triplet generation (0.06 to 0.60), and rate constants for triplet quenching (0.18 to 4.8 x $10^{8}$ $M^{-1}$ $s^{-1}$ in solvents ranging from dimethyl sulfoxide to cyclohexane). As with aromatic hydrocarbons, the dependence of triplet quenching rate constants for polyenes on triplet energy (E/sub T/) is found to be parabolic; that is, they first decrease systematically on going from trans-stilbene (n=1) to trans- 1,6-diphenyl-1,3,5-hexatriene (n=3) and then increase on going from the latter to trans-1,8-diphenyl-1,3,5,7-octatetraene (n = 4). Possible interactions in terms of charge transfer, energy transfer, and electron exchange as well as roles of torsional motions and twisted configurations of polyenes in the quenching processes are discussed. 5 figures, 4 tables.

3009 **Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair.** Schanze, K.S. (Univ. of North Carolina, Chapel Hill); Giannotti, C.; Whitten, D.G. *Journal of the American Chemical Society;* **105**: No. 20, 6326-6327(5 Oct 1983). Contract AS05-81ER10815.

Photolysis (546) of degassed solutions of thioindigo(TI) with tertiary amines leads to bleaching of the visible absorption band at 540 nm concurrent with the development of a solvent-dependent absorbance at 390 to 435 nm. Isobiestic points are maintained throughout the irradiation. Upon admission of air to the photolyzed solutions, quantitative regeneration of the visible absorbance spectrum characteristic of TI occurs. Mass spectral analysis shows that the photoproduct has a mol wt of 298 g/mol. These results are consistent with the hypothesis that photoreduction of TI by electron donors occurs leading to net 2-electron reduction and formation of $TIH_2$; air oxidation of $TIH_2$ regenerates TI. Limiting quantum yields are in the range 0.03 to 0.5. 2 figures.

3010 **Formation of photoactive charge-transfer complexes between methylviologen and sacrificial electron donors. EDTA and triethanolamine.** Hoffman, M.Z.; Prasad, D.R.; Jones, G. II; Malba, V. (Boston Univ., MA). *Journal of the American Chemical Society;* **105**: No. 20, 6360-6362(5 Oct 1983).

Mixtures of methylviologen and ethylenediaminetetraacetic (EDTA) acid or triethanolamine (TEOA) in aqueous solutions exhibit a new absorption band which is a function of the pH with a profile consistent with the requirement that the diprotonated amine function for TEOA is involved in the complexation. Calculated quantum yields of formation of the complex are a function of pH value, the composition of the solution, and decrease as the [donor]/[acceptor] ratio is increased. The latter effect suggests that excess donor may quench the excited state(s) of the complex and/or that a series of complexes is formed, each with its own photoactivity. A mechanism for the irreversible photogeneration of the complex in alkaline solution is given. 1 figure, 1 table.

3011 **High vibrational overtone photochemistry of 1-cyclopropylcyclobutene.** Jasinski, J.M.; Frisoli, J.K.; Moore, C.B. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **87**: No. 20, 3826-3829(29 Sep 1983). Contract AC03-76SF00098.

Laser excitation of high CH stretching overtones has been used to induce the isomerization of 1-cyclo-propylcyclobutene (CYCB) to 2-cyclopropyl-1,3-butadiene. Values of the unimolecular isomerization rate constant, k(E), have been measured for excitation of the fifth cyclobutenyl and cyclopropyl methylenic CH stretching overtones. The values of k(E) depend only on total energy and do not show any identifiable dependence on which type of CH overtone is excited. In particular, excitation of the cyclobutenyl methylenic CH overtone transition does not lead to any observable enhancement in k(E) relative to excitation of the cyclopropyl methylenic CH overtone transition. The value of k(E) for excitation of the cyclobutenyl methylenic CH overtone transition does not increase even when 99.8% of the excited molecules are collisionally deactivated prior to reaction. This leads to the conclusion that any vibrational energy which is introduced into the cyclobutenyl ring by overtone excitation is randomized over both the cyclobutenyl and cyclopropyl rings prior to reaction. 4 figures.

3012 **Radiative and nonradiative relaxation dynamics of sulfur dioxide excited in the 3000 to 3300-A region. Fluorescence emission spectra and lifetimes of single rotational levels.** Holtermann, D.L. (Univ. of California, Irvine); Lee, E.K.C.; Nanes, R. *Journal of Physical Chemistry;* **87**: No. 20, 3926-3933(29 Sep 1983). Contract AT03-76ER70217.

Emission spectra from single rotational levels (SRL's) of $SO_2$ excited in the 3000-3400-A region have been recorded and are found to be in agreement with the earlier emission study of single vibronic levels (SVL's) by Shaw et al. The ratio of continuum to discrete emission is observed to increase with increasing excitation energy and pressure. Zero-pressure lifetimes of 41 SRL's in 7 different vibronic levels have been measured and show a systematic decrease with increasing excitation energy. These lifetimes variations and changes in the continuum vs. discrete emission have been interpreted in terms of a mixed vibronic state involving the zero-order $^1A_2$ state and $^1B_1$ state perturbed to varying degrees by the Renner-Teller interaction with the $^1A_1$ ground state. 8 figures, 7 tables.

3013 **Molecular Rydberg states. Low-energy Rydberg states of azulene.** Lewis, J.W. (Louisiana State Univ., Baton Rouge); Nauman, R.V.; Bouler, D.B. Jr.; McGlynn, S.P. *Journal of Physical Chemistry;* **87**: No. 19, 3611-3615(15 Sep 1983).

Electronic spectra of azulenes are discussed. The low-energy Rydberg states are emphasized. The 3d-Rydberg states lie at 45,000 to 50,000 $cm^{-1}$. They are partially quenched by chemical substituents and totally quenched in condensed media. The 3p-Rydberg states lie at ~ 40,000 $cm^{-1}$ in azulene and are largely quenched in all derivatives. The quenching of the 3p Rydbergs of azulene in condensed media is responsible for much of the alterations that occur in the $S_4$ reverse arrow $S_0$ absorption region of azulene upon going from gaseous to condensed phases. The 3s-Rydberg states should lie in the $S_2$, $S_3$, low-energy $S_4$ reverse arrow $S_0$ absorption region. Investigations of this region demonstrate two phase-dependent behavioral peculiarities. However, neither of these provides acceptable proof of the presence of a low-energy 3s Rydberg.

3014 **Molecular beam study of the photochemistry of $S_1$ glyoxal.** Hepburn, J.W.; Buss, R.J.; Butler, L.J.; Lee, Y.T. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **87**: No. 19, 3638-3641(15 Sep 1983). Contract AC03-76SF00098.

The dissociation of glyoxal after excitation to low-lying vibrational levels of the first excited singlet state has been studied by using the method of molecular beam photofragment translational spectroscopy. Detection of products at masses 28, 29, and 30 provides unequivocal proof that the $S_1$ state of glyoxal predissociates in the absence of collisions. The product time-of-flight (TOF) spectra show the presence of three distinct dissociation channels, the major ones being formation of $H_2CO$ + CO and the triple dissociation forming 2CO + $H_2$. The third minor channel is attributed to the formation of CO plus an $H_2CO$ isomer, possibly hydroxymethylene. 2 figures.

3015 **Photochemistry of methyl viologen in aqueous and methanolic solutions.** Ebbesen, T.W.; Ferraudi, G. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry;* **87**: No. 19, 3717-3721(15 Sep 1983).

The photochemistry of $MV^{2+}(Cl^-)_2$ (methyl viologen; paraquat; 1,1'-dimethyl-4,4'-bipyridinium dichloride) has been investigated in both $H_2O$ and methanol ($CH_3OH$). Demonstrated is the fact that the observed photochemistry occurs via the ground-state charge-transfer complexation with the halide counterion(s). In $H_2O$, the radical pair $MV^+.Cl_2^-$. is formed with a quantum yield of 0.2 from the dichloride complex (K/sub 2Cl/ = 1.4 $M^{-1}$) with a rate > $10^8 s^{-1}$. The $MV^+.Cl_2^-$. formation and decay is pH independent (1.5 to 9), the kinetics of the disappearance being second order. When the $Cl^-$ counterions are replaced by $Br^-$ (K/sub 2Br/ = 1.8 $M^{-1}$) or by $I^-$ (K/sub 2I/ = 3.2 $M^{-1}$) the quantum yield drops dramatically (< 0.01). By comparison with $Cs^+$ it is concluded that an intracomplex heavy-atom effect is observed. In methanol, where the end product is $MV^+.Cl^-$, it is shown that the radical pair $MV^+.Cl$. must be an intermediate in the formation of the initial

methoxy radical and $MV^{+}$., the observed quantum yield of the latter being strongly dependent on the chloride concentration. Furthermore, in agreement with previous suggestions in the literature, the results indicate that a weak methyl viologen chloride-methanol complex is involved in the $MV^{2+}(Cl^{-})_2$ photochemistry in methanol. 6 figures.

3016 **Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates.** Kurihara, K.; Tundo, P.; Fendler, J.H. (Clarkson Coll. of Tech., Potsdam, NY). *Journal of Physical Chemistry;* **87**: No. 19, 3777-3782(15 Sep 1983).

Photosensitized electron transfer and charge separation have been demonstrated by steady-state and nanosecond laser flash photolysis in the presence of redox active surfactant aggregates prepared from $CH_2{=}{=}C(CH_3)\text{-}COO(CH_2)_{11}(C_6H_4N^{+})_2CH_3,Br^{-},I^{-}$ ($RMV^{2+}$). Tris(2,2'-bipyridine)ruthenium chloride ($Ru(bpy)_3^{2+}$) has been used as a sensitizer. Forward electron transfer from excited $Ru(bpy)_3^{2+}$ to $RMV^{2+}$ aggregates has been shown to be faster than that from $Ru(bpy)_3^{2+}$ to methylviologen ($MV^{2+}$) in homogeneous solutions. Conversely, the undesirable back-reaction between the reduced electron acceptor $RMV^{+}$ and the oxidized sensitizer $Ru(bpy)_3^{3+}$ has been found to be considerably retarded compared to the reaction between $MV^{+}$ and $Ru(bpy)_3^{3+}$. Further, unlike $MV^{+}$., $RMV^{+}$. decayed by a two-step process. These results have been rationalized in terms of a mechanism which requires most of the photosensitized forward electron transfer to occur on the surface of $RMV^{2+}$ aggregates. Subsequently, some of the oxidized sensitizer escapes the potential field of $RMV^{2+}$ and charge recombination is retarded by electrostatic repulsions between the positively charged aggregates and $Ru(bpy)_3^{3+}$. 10 figures, 1 table.

3017 **Photoinduced electron-transfer reactions in a chlorophyllide-pheophorbide cyclophane. A model for photosynthetic reaction centers.** Overfield, R.E. (Univ. of Illinois, Urbana); Scherz, A.; Kaufmann, K.J.; Wasielewski, M.R. *Journal of the American Chemical Society;* **105**: No. 18, 5747-5752(7 Sep 1983).

The fluorescence and the lowest excited triplet state yields for a chlorophyllide-pheophorbide cyclophane are strongly quenched as the dielectric constant of the solvent in which it is dissolved increases. The decrease in fluorescence yield is accompanied by a decrease in fluorescence lifetime. The radiative rate for fluorescence remains approximately constant. Fluorescence decays of thecyclophane are best fit with two exponentials. The short component is 250 +- 50 ps, while the long component is about 2 to 4 ns. Time resolved absorbance changes at 655 and 445 nm are used to follow the decay of the excited states back to the ground state. A residual absorbance having a lifetime in excess of 30 ns is found in all solvents and is ascribed to the lowest excited triplet state of the cyclophane. After correction for this contribution the decay of the absorbance changes is best fit with a single exponential. In dichloromethane and butyronitile the absorbance decay times, 1.6 ns and 435 ps, respectively, are longer than the 250-ps fluorescence emission component of the cyclophane in these solvents. This indicates that a nonemissive excited state is formed. The observed dependence of both the fluorescence and the absorption change decays on the solvent dielectric constant suggests that quenching of the lowest excited singlet state involves an electron-transfer reaction. The electron-transfer rate is $2 \times 10^{9}\ S^{-1}$, while the rate of the back electron transfer yielding the cyclophane in its ground electronic state is $10^{9}\ S^{-1}$. The forward electron-transfer rate is about 100 times slower than that of photosynthetic reaction centers despite the close proximity of the donor and the acceptor (<6 A). The difference in electron-transfer rates between the cyclophane and photosynthetic reaction centers is rationalized in terms of the importance of donor-acceptor orientation.

3018 **Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems.** Li, A.S.W.; Kevan, L. (Univ. of Houston, TX). *Journal of the American Chemical Society;* **105**: No. 18, 5752-5755(7 Sep 1983). Contract AS05-80ER10745.

The photoionization of N,N,N',N'-tetramethylbenzidine (TMB) in dihexadecylphosphate anionic vesicles and in dioctadecyldimethylammonium chloride cationic vesicles has been studied by optical absorption and electron spin resonance in liquid and frozen solutions. The TMB cation has been observed to be stabilized in both types of vesicles. The photoionization efficiency is about twofold greater in the cationic vesicles compared to the anionic vesicles. Shifts in the optical absorption maximum between micellar and vesicle solutions indicate that TMB is in a less polar environment in the vesicle systems. Electron spin echo modulation spectrometry has been used to detect TMB cation-water interactions that are found to be weaker than in previously studied micellar solutions. This is consistent with the optical absorption results and with an asymmetric solubilization site for TMB and $TMB^{+}$ within the vesicular structure. A new absorption in the photoionized vesicles is assigned to a nonparamagnetic diamine-diimine charge-transfer complex between two TMB cations in the same vesicle. This complex is not formed in micellar systems. 5 figures.

3019 **Infrared photochemistry of specifically deuterated bicyclopropyl. A direct test of statistical unimolecular rate theory applied to branching ratios in multiphoton dissociation.** Farneth, W.E.; Thomsen, M.W. (Univ. of Minnesota, Minneapolis). *Journal of Physical Chemistry;* **87**: No. 17, 3207-3212(18 Aug 1983). Contract AC02-80ER10592.

The infrared photochemical decomposition of bicyclopropyl-$d_4$, specifically deuterated on one ring, has been examined. The molecule incorporates two reactive moieties that are differentiated only by isotopic substitution, hydrogenated and deuterated cyclopropane rings. Since statistical theories predict essentially equivalent rates of decomposition of each ring at any internal energy, the branching ratio constitutes a direct probe for nonstatistical effects. From a determination of the deuterium distribution in the single-ring cleaved product, allylcyclopropane, a branching ratio, k/sub H//k/sub D/ = 1.03 +- 0.08, is calculated. This is in good agreement with the statistical prediction and provides direct chemical evidence for the lack of significant nonrandom chemistry in the multiphoton infrared photochemistry of bicyclopropyl under the conditions of these experiments. 6 figures, 1 table.

3020 **Direct observation of radical-pair interaction and decay in anionic micelles. A time-resolved electron-spin-echo study.** Thurnauer, M.C.; Meisel, D. (Argonne National Lab., IL). *Journal of the American Chemical Society;* **105**: No. 11, 3729-3731(11 Jun 1983). Contract W-31-109-ENG-38.

Photochemical reactions in micelles currently receive considerable attention. They provide models for reactions in biological membranes and are also relevant to photochemical energy conversion problems. Recently attention has been drawn to the influence of micelles on radical-pair interactions that can, in turn, control reaction selectivity. The application of time-resolved electron-spin-echo (ESE) spectroscopy to study photoreactions in micelles is reported upon. The application of time-resolved ESE to photoreactions in micelles supports the mechanism proposed to explain a time-dependent echo phase shift. It also demonstrates that these methods can be used to obtain directly the rate of radical escape from micelles and observe directly radical-pair interactions within the micelle.

3021 **Synthesis, structure, and photochemistry of tetracarbonyl(fulvalene)diruthenium. Thermally reversible photoisomerization involving carbon-carbon bond activation at a dimetal center.** Vollhardt, K.P.; Weidman, T.W. (Univ. of California, Berkeley). *Journal of the American Chemical Society;* **105**: No. 6, 1676-1677(23 Mar 1983). Contract AC03-76SF00098.

The $\eta^5{:}\eta^5$-fulvalene ligand constitutes an attractive matrix on which to firmly affix two metal atoms in close enough proximity to enable metal-metal bonding while allowing complexes to retain dinuclear character after potential metal-metal fission. A new synthetic approach to dimetallafulvalenes, some preliminary chemistry of a diruthenium derivative, and its unexpected photoreactions are reported.

3022 **Competing dissociation channels in the infrared multiphoton decomposition of ethyl vinyl ether.** Huisken, F.; Krajnovich, D.; Zhang, Z.; Shen, Y.R.; Lee, Y.T. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Journal of Chemical Physics;* **78**: No. 6, 3806-3815(15 Mar 1983).

Infrared multiphoton decomposition of ethyl vinyl ether (EVE) has been investigated by the crossed laser-molecular beam technique. Competition is observed between the two lowest-energy dissociation channels: (1) EVE → $CH_3CHO+C_2H_4$, and (2) EVE → $CH_2CHO+C_2H_5$. Center-of-mass product translational energy distributions were obtained for both dissociation channels. The products of reactions (1) and (2) are formed with mean translational energies of 31 and 5 kcal/mol, respectively. The branching ratio shifts dramatically in favor of the higher energy radical producing channel as the laser intensity and energy fluence are increased, in agreement with the qualitative predictions of statistical unimolecular rate theory.

3023 **Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system.** Cristol, S.J.; Dickenson, W.A.; Stanko, M.K. (Univ. of Colorado, Boulder). *Journal of the American Chemical Society;* **105**: No. 5, 1218-1220(9 Mar 1983). Contract AC02-79ER10366.

The epimers 6-anti- and 6-syn-7-dichloro-2,3-benzobicyclo[2.2.2]octa-2,5-diene (7-Cl and 8-Cl) have been subjected to irradiation in wet acetonitrile at 254 nm. The epimer 7-Cl with chlorine anti to the benzene ring chromophore is photoactive, giving photo-Wagner-Meerwein isomerization and photosolvolysis to Wagner-Meerwein rearranged acetamides. Both the isomerization and the solvolysis (photo-Ritter reaction) are nonsterospecific, although migration of the syn chloroethenyl group occurs in modest preference to that of the anti benzo group. The syn chloride 8-Cl is relatively photoinert, and no products attributable to photosolvolysis or photo-Wagner-Meerwein isomerization are produced.

3024 **Variations in mechanism for photoinduced valence isomerizaation of an electron-donor nonconjugated diene.** Jones, G. II; Becker, W.G.; Chiang, S.H. (Boston Univ., MA). *Journal of the American Chemical Society;* **105**: No. 5, 1269-1276(9 Mar 1983).

Photoisomerization of 1,4,4a,8,8a-hexahydro-1,4,5,8-endo,endo-dimethanonaphthalene (3) has been studied in detail. Rearrangement to the cage photoisomer occurs on direct irradiation or with triplet sensitizers with quantum efficiency as high as 1.0. Irradiation in the presence of electron acceptors whose fluorescence is quenched by 3 also results in cage formation. Quantum yields approach 1.0 for donor-acceptor sensitization in a nonpolar solvent. For this reaction, a mechanism is proposed that involves excitation transfer within an exciplex of sensitizer and 3 and partitioning of locally excited 3 at a biradicaloid geometry. Quantum efficiencies exceed unity for rearrangement sensitized by electron acceptors in polar media. A chain mechanism is proposed that involves radical-cation intermediates obtained through electron transfer from 3. Irradiation of ground-state (charge-transfer) complexes of 3 and fumaronitrile or diethyl 1,2-dicyanofumarate also results in valence isomerization with quantum yields that are dependent on solvent polarity and excitation wavelength. The options available for photosensitization of 3 and a related diene, norbornadiene, are discussed.

3025 **Photoisomerization of charge-transfer complexes of hexamethyl(Dewar benzene). Contrasting paths for rearrangement involving adiabatic reaction and ionic photodissocation.** Jones, G. II; Becker, W.G. (Boston Univ., MA). *Journal of the American Chemical Society;* **105**: No. 5, 1276-1283(9 Mar 1983).

The charge-transfer (CT) complexes of hexamethyl(Dewar benzene) (HMDB) with electron acceptors, fumaronitrile, diethyl 1,2-dicyanofumarate, and 1,2,4,5-tetracyanobenzene, have been characterized and compared to similar complexes of hexamethylbenzene (HMB). Irradiation of HMDB CT bands in the 313-435-nm region under a variety of conditions leads to HMDB → HMB isomerization. The quantum yield of rearrangement in a nonpolar solvent is low (e.g. 0.06), although the relative yield of adiabatic isomerization, monitored by emission for excited complexes of HMB, is high (0.72). Quantum efficiencies for isomerization of complexes in polar media generally exceed unity, consistent with a radical-ion chain mechanism for ring opening. The quatum chain reaction depends on the polarity of the solvent, the reduction potential of the acceptor, the extent of conversion, and the wavelength of irradiation. The wavelength effect is associated with excitation to upper vibrational levels of a CT band with enchancement of ionic photodissociation. Comparison of the quantum yield results for excited CT complexes with the findings for rearrangement of HMDB via exciplexes reveals generally different patterns of reactivity.

3026 **Infrared laser induced heterogeneous reactions: 2-propanol with cupric oxide.** Farneth, W.D.; Zimmerman, P.G.; Hogenkamp, D.J.; Kennedy, S.D. (Univ. of Minnesota, Minneapolis). *Journal of the American Chemical Society;* **105**: No. 5, 1126-1129(9 Mar 1983). Contract AC02-80ER10592.

The heterogeneous decomposition of 2-propanol vapor in the presence of CuO solid has been induced by infrared laser radiation. The reaction produces both acetone by dehydrogenation and propene by dehydration. Yields and branching ratios are quite sensitive to experimental variables. Experiments have been carried out in one of two basic configurations: either the CuO surface is parallel to the laser beam as it passes through the cell or the CuO surface is perpendicular to and intercepts the laser beam. Reaction occurs in both geometries although much more readily in the latter. Branching ratios from 0.02 to 6.0 have been observed.

3027 **A convenient route to superoxide ion in aqueous solution.** McDowell, M.S.; Bakac, A.; Espenson, J.H. (Iowa State Univ., Ames). *Inorganic Chemistry;* **22**: No. 5, 847-848(2 Mar 1983). Contract W-7405-ENG-82.

Conditions are described for a convenient and inexpensive alternative for producing $O^-_2$ solutions of appreciable concentration. The $n\text{-}\pi^*$ triplet state of a ketone is quenched by reaction with a primary or secondary alcohol. The chemical reactions used in air or $O_2$-saturated solutions generate $O_2^-$ independent of the alcohol or ketone used.

3028 **Photoreactions and photoelectrochemical effects in supported multilayer assemblies. Mechanisms of interfacial reactions involving reactive supports, metalloporphyrin surface films, and solutions.** Chandrasekaran, K. (Univ. of North Carolina, Chapel Hill); Giannotti, C.; Monserrat, K.; Otruba, J.P.; Whitten, D.G. *Journal of the American Chemical Society;* **104**: No. 23, 6200-6206(17 Nov 1982). Contract AS05-81ER10815.

An investigation of photoprocesses occurring in molecular assemblies consisting of monolayers and multilayers of water-insoluble surfactant tin porphyrins supported on tin oxide optically transparent electrodes and other potentially reactive surfaces in contact with aqueous solutions containing potentially reducing solutes is reported. In each case the light-absorbing species is the surface-bound tin porphyrin. While irradiation of glass- or quartz-supported monolayers and multilayers of the tin porphyrins in contact with aqueous reductants such as amines, hydroquinone, of p-dimethoxybenzene leads to net photoreduction and photoaddition processes for the porphyrin to yield chlorin- and isobacteriochlorin-type products, the net reactivity of the porphyrin is totally quenched or sharply reduced when it is contained in assemblies in contact with n-type $SnO_2$, $PtO_2$, or platinum films. Several experiments were carried out which demonstrate that excited states of the porphyrin are not strongly quenched by the various supports; thus in this case the major effect of the surface is to intercept reduced species formed in the interfacial photoreaction of the porphyrins with the reducing solute. The $SnO_2$-supported porphyrin assemblies can serve as photoanodes for the oxidation of solution reductants; in typical experiments slides having areas ca. 3 $cm^2$ give photocurrents in the ~300-nA range with a quantum efficiency of 0.3%. The low quantum efficiency observed is comparable to that measured for interfacial or homogeneous-solution reduction of the tin porphyrin by the same solutes; thus the net reactivity of the porphyrin in solution and at interfaces appears relatively comparable in these cases and is

probably limited by net physical quenching of the porphyrin and triplet by the solute reductant.

3029 **Real-time detection of methyl radicals by diode laser absorption at 608 $cm^{-1}$.** Laguna, G.A.; Baughcum, S.L. (Los Alamos National Lab., NM). *Chemical Physics Letters;* **88**: No. 6, 568-571(28 May 1982).

A time-resolved technique has been developed for the detection of $CH_3$ radicals in the gas phase by diode laser absorption at 608 $cm^{-1}$ on a rotation-vibration transition of the $nu_2$ mode of $CH_3$. The usefulness of the technique as a probe of the reaction kinetics is demonstrated by the measurement of the recombination rate of $CH_3$ radicals and the third-body reaction rate of $CH_3$ with $O_2$ at room temperature. 4 figures, 1 table.

## 4006 Radiation Chemistry

*REFER ALSO TO CITATION(S) 1914*

3030 **(AD-A—132044/9) Radiolysis of resist polymers. IV. Poly(p-substituted-alpha-methylstyrenes). Technical report.** Babu, G.N.; Lu, P.H.; Hsu, S.L.; Chien, J.C.W. (Massachusetts Univ., Amherst (USA). Materials Research Lab.). Aug 1983. 32p. (TR—4). NTIS, PC A03/MF A01.

The effect of saver-substituent on the radiation chemistry of poly(alpha-methylstyrene) (PMS) was compared for the fluoro (PFMS), chloro (PCMS), bromo (PBMS) isopropyl (PIPMS) and methoxy (PMEOM) derivatives. The radiolysis yields, ESR spectra and GC-MS analysis of products were obtained. PMEOMS and PIPMS gel readily by gamma-radiation. They may be useful as negative resist materials.

3031 **(HMI-B—317) Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane.** Doeldissen, W. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.); Freie Univ. Berlin (Germany, F.R.). Fachbereich Physik). 30 Apr 1980. 204p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751362.

Excess electron mobility in liquid ethane was measured under orthobaric conditions as a function of temperature and electric field strength up to critical temperature of 305.33 K. The low field mobility was found to rise strongly with temperature and exhibits a maximum value at two degrees below the critical temperature. At temperatures above 260 K the electron drift velocity shows a sublinear field dependence at high values of the electric field strength. Measurements in fluid ethane showed an increase of the low field mobility with temperature. This effect disappeared both at low and high densities. In liquid tetramethylsilane at 296 K the excess electron drift velocity was studied as a function of the electric field strength. The results are discussed on the hot electron theory and it is concluded that excitation of skeletal vibrations of energy 0.04 eV leads to the observed saturation. Intrinsic photoconductivity of liquid tetramethylsilane was observed in the wave length region from 110 to 150 nm. The photoionization threshold has been determined to be 8.1 eV.

3032 **(INIS-mf—8273) Radiation induced modification of polyurethane for biomedical applications.** Jansen, B. (Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 13 Dec 1980. 194p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83704392.

The polyether urethane WH8 was modified by radiation induced grafting, Biocompatibility was achieved using hydrophil or hydrophil made monomers. Grafting of the monomers HEMA, GMA, GOMA and AAm onto the polyether urethane was performed by means of preswelling technique. By variation of preswelling time and irradiation dose different degrees of grafting were obtained. The grafted products were characterized by IR-Spectroscopy and the deepness of grafting was determined for the systems WH8-g-HEMA, WH8-g-GMA and WH8-g-AAm. Mechanical properties of the basis polymer and the grafted samples were measured by tension-extension experiments in the dry and waterswelled state. To the systems WH8-g-GMA and WH8-g-AAm hydrophil groups as the diol and the sulfonic group were attached by chemical reactions. The content of water of modified samples was determined and rose with increasing degree of grafting. To characterize the surface the contact angle against water (THETAsub($H_2O$)) and octane (THETAsub(octane)THETAsub($H_2O$)) was determined and therefrom the free boundary surface energy (ysw) between the polymer and water. Increasing the degree of grafting adsorption of albumine rises strongly with all systems. Cell culture tests and biocompatibility tests were positive with one exception. The influence of the samples on the intravasal curdling system was determined by measuring recalcification time after incubation in human plasma.

3033 **(PB—83-239566) Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82.** Senich, G.A.; Florin, R.E. (National Bureau of Standards, Washington, DC (USA). Inst. for Applied Technology). Jun 1983. 133p. (NBSIR—83-2722). NTIS, PC A07/MF A01.

The science and technology of curing organic materials with radiation is reviewed. Electron beam, ultraviolet, infrared, microwave, and high frequency radiation sources and the resin systems suitable for use with these sources are considered. Equipment necessary to affect a radiation cure is discussed and some practical problems unique to each radiation method are indicated. The application of radiation curing to industrial processes which employ inks and coatings is covered, with particular emphasis given to printing with radiation curable formulations. Included are discussions of the advantages and disadvantages of radiation curing inks, some typical ink components and formulations, the specialized machinery required, and the influence of parameters unique to radiation curing methods on the printing process. Other nonprinting but related industrial operations utilizing radiation for treating thin films and coatings are also considered. Some costs, examples, and market statistics are given for these commercial procedures. New nonconventional, but also nonradiation, alternative curing methods are discussed briefly. A bibliography of recommended further reading and a list of over two hundred fifty references are included.

3034 **Rapid long range intramolecular electron transfer within a steroid molecule with two electron binding groups.** Huddleston, R.K.; Miller, J.R. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **79**: No. 11, 5337-5344(1 Dec 1983). Contract W-31-109-ENG-38.

Intramolecular electron transfer has been observed to have occurred in less than 100 ns in a steroid molecule having two distinct electron binding groups separated by distances distributed from 7—11 A. Experiments were carried out in organic glasses at 77 K with pulse radiolysis techniques to create trapped electrons which were captured by a group on one end of the steroid molecule. Although one of the groups, benzoate, is held to the steroid spacer by a flexible linkage, the rigidity of the glassy matrices prevented movement to alter the initial distance. Interestingly, no effects of distance were seen: all ET processes appeared to have occurred much faster than our 100 ns time resolution, consistent with measurements of the rate of intermolecular electron transfer between the same functional groups in random solutions. Solvation energetics, on the other hand, had a remarkable influence on the extent and direction of electron transfer. A change in solvent polarity was observed to reverse the direction of electron transfer. Evidence was obtained for a distribution of solvation environments for ions in glasses which may be as broad as 0.15 eV.

3035 **Preparation and reactions of $Cr^-$. The Cr-H bond strength.** Sallans, L.; Lane, K.; Squires, R.R.; Freiser, B.S. (Purdue Univ., West Lafayette, IN). *Journal of the American Chemical Society;* **105**: No. 20, 6352-6354(5 Oct 1983).

A Fourier transform mass spectrometer utilizing collision-induced dissociation (CID) of anionic chromium (Cr) carbonyl complexes was used to study the gas-phase reactivity of the metal anion. Measurements are consistent with a relatively weak Cr-C bond in $CrCO^-$ which reflects the inherent stability of the $3d^5 4s^2$ $Cr^-$ fragment. Also, the chromium atom is relatively weakly bound in $Cr_2(CO)_6^-$ as shown by the loss of the metal ion from the complex when subjected to low-energy CID excitation. A Cr-H bond

energy of 41.8 +- kcal $mol^{-1}$ was calculated from the literature reported electron affinity of Cr(1.5 +- 0.2 kcal $mol^{-1}$), ionization potential of hydrogen (313.6 kcal $mol^{-1}$), and the authors' assigned proton affinity of Cr (340 +- 3 kcal $mol^{-1}$). 2 figures, 1 table.

3036 **Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization.** Salyer, I.O.; Davison, J.E. (Univ. of Dayton, OH). *Journal of Applied Polymer Science;* **28**: No. 9, 2903-2924(Sep 1983).

Electron beam cross-linking of high-density polyethylene (HDPE) was studied to obtain pellets for phase-change thermal-energy storage that retain their original shape and form through repeated melt/freeze cycles, and thus serve as their own container. Electron-beam voltage, amperage, atmosphere, pellet-bed depth, traverse rate, and total dose were varied to establish cost/effective conditions for adequate thermal form stability combined with highest retention of heat of fusion. The results of electron beam crosslinking are compared with chemical crosslinking in cost and effectiveness. Utility of the electron-beam crosslinked HDPE pellets in a low-cost, efficient pellet-bed heat exchanger was demonstrated. Potential applications discussed include thermal storage for home heating and cooling, industrial processing, and off-peak electric utilization for load leveling. 15 figures, 5 tables.

3037 **Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics.** Brault, D.; Neta, P. (CNRS, Paris, France). *Journal of Physical Chemistry;* **87**: No. 17, 3320-3327(18 Aug 1983).

Pulse radiolysis of aqueous and nonaqueous 2-propanol-acetone-carbon tetrachloride mixtures has been investigated by means of conductivity measurements and spectrophotometry. In these solvent mixtures, a pulse of hydrochloric acid originating from either primary events of solvent radiolysis or from further reactions of carbon tetrachloride with radicals derived from 2-propanol and acetone, is produced within ca 100 nanoseconds. Further production of hydrochloric acid occurs as a result of chain reactions involving hydrogen abstraction by $CCl_3$ or $CCl_3O_2$ radicals. These latter radicals appear to be much more reactive and are likely to be involved in the reaction unless the solutions have been thoroughly deoxygenated. Protonation Reactions of porphyrins and ferriporphyrins, which do not react rapidly with the above radicals, were followed by means of spectrophotometric measurements. In turn, these reactions may be used to monitor hydrochloric acid formation. Spectrophotometric measurements on porphyrins corroborate conductivity results, although a quantitative comparison is not feasible because of differences in solvent properties. 6 figures.

3038 **A pulse radiolysis study of the excitation of nitrogen and aromatic hydrocarbons in rare gas-additive mixtures: Evidence for subexcitation electron interactions.** Cooper, R. (Univ. of Melbourne, Victoria, Australia); Denison, L.; Sauer, M.C. Jr. *Journal of Physical Chemistry;* **86**: No. 26, 5093-5097(23 Dec 1982). Contract W-31-109-ENG-38.

The technique of pulse radiolysis has been used to study the kinetics of formation and decay of excited states in electron-irradiated rare gas/trace additive mixtures. In mixtures of ultrapure helium or neon with nitrogen, the formation of the $C^3II$/sub u/ state of $N_2$ could be observed via light emission at very low pressures of $N_2$. The rate of formation of $N_2$ emission was dependent on $N_2$ pressure, the emission decay was in agreement with the known radiative lifetime of the $C^3II$/sub u/ state, and the kinetics could be described adequately by a sequential two-step process. The dependence of the rate constant for the formation of $N_2(C^3II$/sub u/) on nitrogen pressure yields a second-order rate constant of approximately 5 x $10^{12}$ $dm^3$ $mol^{-1}$ $s^{-1}$. This precludes any atomic or molecular two-body energy transfer process or collisional relaxation from higher levels created by the initiating pulse of electrons. It is concluded that the excitation of $N_2$ is due to electrons of energy between the lowest rare gas energy level and the energy levels of nitrogen, i.e., subexcitation electrons. The rate of formation of nitrogen emission was also dependent on the rare gas pressure but to a much smaller degree than on nitrogen pressure. This effect is directly attributable to the "cooling" of epithermal electrons by collisional momentum transfer process. Similar phenomena were obeserved in rare gas/tetracene and rare gas/anthracene mixtures.

## 4007 Radiochemistry And Nuclear Chemistry

*REFER ALSO TO CITATION(S) 1926, 2735, 2971, 3391, 3905*

3039 **(FRNC-TH—1146) Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am).** Tabuteau, Alain. (Paris-6 Univ., 75 (France)). May 1981. 222p. (In French). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83704390.

This paper includes: 1) The brief description of the experimental techniques used for analyzing very small quantities of solid radioactive compounds (differential thermal micro-analyses, diffraction of X rays, magnetic susceptibility and Moessbauer resonance). 2) The methods of synthesis of the ternary oxides of transuranic elements at oxidation degrees III ($Pu_2MoO_6$, $Pu_2WO_6$, $Pu_2(WO_4)_3$, $Am_2MoO_6$, $Am_2WO_6$, $Am_2(MoO_4)_3$ and $Am_2(WO_4)_3$) and at degree IV ($Np(VO_3)_4$, $Np(MoO_4)_2$, $Np(WO_4)_2$ and $Pu(MoO_4)_2$). The drawing up of liquid-solid balance diagrams enabled the field of stability of molybdate (or tungstate) systems of alkaline transuranic - mobybdates (or tungstates) to be clarified. 3) The study of the structural properties of the identified phases. These results taken as a whole made it possible to establish a "comparative crystal - chemistry" of the oxigenated phases of Np, Pu and Am with those of the thorium and uranium actinide elements and with the rare earths of adjacent ionic radius. 4) The Moessbauer resonance study of $^{237}Np$ in the solid solution Usub(1-x)Npsub(x)$O_2$ ($0 < x <= 1$). The analysis of the results obtained is the subject of Part IV of the manuscript. 5) The effects of alpha self-irradiation mentioned in the last part show that it is necessary to gather fresh information on the condensed phases containing heavy radioactive atoms.

3040 **(INIS-mf—8263) Spectroscopic investigations of uranium(V) complexes with the coordination number six and eight.** Grape, W. (Technische Univ. Clausthal, Clausthal-Zellerfeld (Germany, F.R.). Fakultaet fuer Natur- und Geisteswissenschaften). 30 Jan 1981. 200p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83704382.

The thesis contains a general part, in which the reaction of uraniumpentaethoxide and acetylacetone, hexa- and octafluorouranates(V), preparation experiments of pentafluorouranium and reflexion and ESR spectra of chloro- and bromouranates(V) are described. The theoretical part deals with the $f^1$-ion in the cubic ligand field and in the field of Dsub(2d) symmetry. In the experimental part preparation and purification of starting chemicals and solvents, general workings hints, the preparation of the complexes and the performance of the measurements are listed.

3041 **(INIS-mf—8264) Imperfections and phase transformations by mono-N-alkylammonium-uranium glimmers.** Kammermeier, H. (Kiel Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 1982. 122p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704394.

Uranium glimmers have a layered structure. Bimolecular intermediate layered films of parallel ordered alkyl chains can be produced by exchange of the intermediate layer cations with the mono-n-alkylammonium ions and the succession of soaking with n-alkanols. Phase changes can occur in these films that are accompanied by a change of the layer distance of the solid inorganic basic matrix. N-alkyl ammonium-n-alkanol-intercalation compounds of uranium glimmers represent systems that can conveniently be examined with X-rays. Thermal phase changes can be performed easily. This paper describes how one can derive conclusions on the reaction mechanism of phase changes in bimolecular alkyl chain films by means of a profile analysis of X-ray reflexes. (orig./HBR).

3042 **(INIS-mf—8266) Labelling of insuline and insuline derivatives with tritium and carbon-14.** Uschkoreit, J. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 3 Jul 1979. 95p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83704391.

Two different labelling methods were investigated. By means of the Wilzbach labelling with diaminosuberoylinsuline the

insuline is irreversibly altered. As a second method the reductive methylation was used, in doing so it was possible to distinguish between mono and dimethylated parts of the reaction product by using C-14 labelled formaldehyde. Furthermore four N,N-dimethylated insuline derivatives were isolated with yields of 25 to 35%. By using C-14 and h-3 labelled reagents insuline can be labelled doubly. Moreover N-terminal amino groups could be protected irreversibly with this method. Furthermore structure-function investigations and investigations concerning the insuline metabolism were done.

3043 (ORNL—5933, pp 98-101) **Transuranium-element processing.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

The production and distribution of transuranium materials is reported. Fabrication of $^{252}Cf$ neutron sources, preparation of $^{240}Pu$, $^{227}Ac$, and $^{254}Es$ are described.

3044 **(PNL—4903) Guide to radiation fixatives.** Tawil, J.J.; Bold, F.C. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1983. Contract AC06-76RL01830. 20p. NTIS, PC A02/MF A01. Order Number DE84000676.

This report identifies and then characterizes a variety of substances available in the market place for potential effectiveness as a fixative on radiologically contaminated surfaces. The substances include both generic chemicals and proprietary products. In selecting a fixative for a particular application, several attributes of the fixative may be relevant to the choice. These attributes include: toxicity, durability, and cleanliness and removability. In addition to the attributes of the fixative, one should also take into account certain characteristics of the site to be treated. These characteristics relate to climate, nature of the surface, use to which the treated surface will be put, subsequent cleanup operations, and type of neighboring surfaces. Finally, costs and potential environmental effects may influence the decision. A variety of fixatives are evaluated with respect to these various attributes and summarized in a reference table.

3045 **Synthesis and characterization of hexakis(alkyl isocyanide) and hexakis(aryl isocyanide) complexes of technetium(I).** Abrams, M.J. (Massachusetts Inst. of Tech., Cambridge); Davison, A.; Jones, A.G.; Costello, C.E.; Pang, H. *Inorganic Chemistry;* **22**: No. 20, 2798-2800(28 Sep 1983).

The complexes, hexakis(alkyl isocyanide) technetium(I) hexafluorophosphate $[Tc(CNR)_6]PF_6$ (where R = tert-butyl, methyl, cyclohexyl, and phenyl), have been prepared by reduction of the pertechnetate ion with aqueous sodium dithionite ($Na_2S_2O_4$) in the presence of the isocyanide ligands. These complexes have been characterized by elemental analysis, optical, ir, and $^1H$ NMR spectroscopy, conductance, cyclic voltammetry, and field desorption mass spectrometry.

3046 **Observation of the asymmetric O—U—O stretch in the vibronic absorption spectrum of uranyl formate monohydrate.** West, W.P.; Muller, C.H. III; Porter, J.T. II; Malley, M.M. (GA Technologies Inc., San Diego, California 92121). *Journal of Chemical Physics;* **78**: No. 6, 3338-3339(15 Mar 1983).

Fluorescence excitation spectra of uranyl formate monohydrate $UO_2(HCOO)_2xH_2O$ at 4.2 K show the $UO^{+2}_2$ asymmetric mode to be active in the vibronic absorption. This assignment is based on the measure uranium isotope shift. It is also observed that the asymmetric mode occurs with a lower frequency than the symmetric in this compound, contrary to the order reported in other uranyl compounds.

3047 **Simple approach for single and double column fabrication for radionuclide generators.** Rayudu, G.V.S.; Turner, D.A.; Fordham, E.W. (Rush Univ. Medical Center, Chicago, IL (USA)); Knapp, F.F. Jr. (Oak Ridge National Lab., TN (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1552-1554(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

3048 **Regiospecific incorporation of radioiodine into aromatic rings via organosilanes.** Wilbur, D.S.; Anderson, K.W.; Stone, W.E.; Svitra, Z.V.; Rogers, R.S.; O'Brien, H.A. (Los Alamos National Lab., NM (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1587-1588(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

3049 **Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow.** Shiue, C.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1591-1592(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

3050 **On-line production of ($^{13}N$)-nitrogen from solid enriched ($^{13}C$)-targets, and its application to ($^{13}N$)-ammonia synthesis using microwave radiation.** Ferrieri, R.A.; Schlyer, D.J.; Wolf, A.P.; Wieland, B. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1614-1615(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

3051 **$CF_4$-$H_2$-Ne gas target for reproducible high yields of anhydrous $H^{18}F$.** Ferrieri, R.A.; MacGregor, R.R.; Rosenthal, S.; Schlyer, D.J.; Fowler, J.S.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1620-1622(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

3052 **Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo.** Zhou, Y.G.; Shiue, C.Y.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1623-1625(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Brief note.

## 4008 Combustion, Pyrolysis, And High-temperature Chemistry

*REFER ALSO TO CITATION(S) 2978, 3238, 3240*

3053 (CONF-8305107—, pp 164-169) **Burnout of large-sized woody fuels.** Anderson, H.E. (Forest Service, Missoula, MT). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The burnout of large-sized woody fuels, 1 to 6 inches thick, is being measured at the USDA Forest Service Northern Forest Fire Laboratory in Missoula, Montana. Physical properties of the fuel bed are varied to determine thresholds for interactive burning, periods of flaming and glowing combustion, and the accuracy of a mathematical model that describes combustion during the flaming phase of burnout. Critical fuel properties include loading, fuel size, and spacing - the distance between outside edges of pieces of the same size. This work is being related to the heat loads on the site and the fire effects on physical and biological features of urban and rural situations.

3054 (CONF-8305107—, pp 195-198) **Spontaneous ignition of solids subjected to linearly time-dependent radiant exposure.** Kanury, A.M. (Univ. of Notre Dame, IN); Gandhi, P.D.; Martin, S.B. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The important problem of spontaneous ignition of solids heated by temporarily variant thermal radiant exposure is studied. Available data are examined in the light of a simple heat balance analysis to find that the observed behavior is predictable. An exposition of the elements of this general problem of ignition behavior of realistic solids under realistic reradiative and free convective loss conditions.

3055 **(LRAP—16) Broadband rotational CARS spectra of simple gases of interest in combustion diagnostics.** Alden, M. (Tekniska Hoegskolan, Lund (Sweden). Fysiska Institutionen). 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751414.

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Pure rotational CARS (Coherent anti-Stokes Raman Spectroscopy) spectra of several molecules, common in a combustion environment, are presented. The recordings were realized using a nonplanar phasematching condition called folded BOXCARS. With this configuration it was possible to record almost zero Raman-shift transitions. The experiments were performed with a broad-band dye laser, permitting single-pulse measurements.

3056 **(LRAP—20) Progress Report 1980-81-82.** Svanberg, S. (ed.). (Tekniska Hoegskolan, Lund (Sweden). Fysiska Institutionen). [nd]. 75p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751415.

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The Department of Physics, Lund Institute of Technology has its research activities in basic and applied optical spectroscopy, to a large extent based on lasers. Basic atomic laser spectroscopy is performed both with CW high-resolution techniques and with time-resolved methods. The activity is concentrated to the study of alkaline earth elements, group III elements and inert gases. A new project, aiming at the investigation of very light atoms like H, C, N and O has been initiated. A variety of techniques like collimated-beam spectroscopy, polarization, optogalvanic and two-photon spectroscopy, quantum-beat, double-resonance and level-crossing spectroscopy are being used. Combustion diagnostics by laser techniques were initiated in 1978, then at Chalmers University of Technology. The project was transferred to Lund in 1980. Spectroscopic techniques development has mainly been performed on flames using laser-induced fluorescence, Raman- and Coherent Anti-Stokes Raman Spectroscopy. From July 1982 a Center for Laser Studies of the Environment (CLM) has been formed within our department. The objectives of the Center is to develop advanced measurement techniques, mainly based on laser spectroscopy methods from the research stage to operational application in the field of environmental control. Present developments include techniques for remote measurement of Hg, NO and CO. Laser-induced fluorescence is used for monitoring of surface cleanliness. UV-induced fluorescence is also used in equipment for the prospecting of fluorescing minerals, in particular scheelite. Some work is also performed in the field of holography and material processing with laser. At the end of the period covered by this progress report the staff of the department amounted to 38. Out of these 12 are graduate students and 14 supporting personnel.

3057 **(PB—83-244012) Flame acceleration mechanisms under conditions of partial confinement. Annual report no. 2, Feb 82-Jan 8.** Strehlow, R.A.; Ormsbee, A.I.; Yip, T.W.G.; Adiasor, M. (Illinois Univ., Urbana (USA). Dept. of Aeronautical and Astronautical Engineering). 23 Feb 1983. 42p. NTIS, PC A03/MF A01.

Studies in the 3-D channel have been discontinued because the complex flow that was observed there makes interpretation of the results difficult. Experiments in the 2-D channel have identified the fact that obstacles placed ahead of the flame shed vortices in the impulsive flow generated by the flame and that these vortices are laminar when produced and subsequently break down to form turbulent vortices. Qualitatively it has been observed that the violence of the flame-vortex interactions increases markedly when the vortex is turbulent.

3058 **Temperature measurement by two-line laser-saturated OH fluorescence in flames.** Lucht, R.P.; Laurendeau, N.M.; Sweeney, D.W. (The authors are with Purdue University, School of Mechanical Engineering, West Lafayette, Indiana 47907.). *Applied Optics;* **21**: No. 20, 3729-3735(15 Oct 1982). Contract AC02-78ER04939.

A technique is proposed and demonstrated for measuring combustion temperatures using two-line laser-saturated fluorescence. The rotational temperature of OH is determined by saturating two different rotational transitions in the (0,0) and of the $A^2$summation$^+$-$X^2$product electronic system and detecting fluorescence emission which originates from the laser-pumped upper rotational levels. Temperature is calculated from the ratio of the fluorescence intensities for the two different excitation-emission pairs. The method is demonstrated by measuring temperature profiles in subatmospheric $H_2/O_2/Ar$ flat flames. Temperatures measured by two-line saturated fluorescence are compared with temperatures measured by coated thermocouples and OH absorption and with predictions from an elementary chemical kinetics code. The temperatures measured by the two-line fluorescence technique are accurate to 3—5% and exhibit low random error.

3059 **Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy.** Elhaderi, A.E. Los Angeles, CA; Univ. of Southern California (1982). vp.

Thesis (Ph. D.).

The dynamic behavior of CO oxidation on $Pt/\gamma\text{-}Al_2O_3$ catalysts was studied in an all Pyrex flow reactor under isothermal conditions and atmospheric pressures with infrared transmission spectroscopy as a tool for in situ characterization of intermediate species on the catalyst surface. The catalysts were made by impregnation of the support with $H_2PtCl_6.H_2O$ solution and were characterized by $H_2$ and CO chemisorption and by Transmission Electron Microscopy (TEM). CO was found to be chemisorbed on Pt at three different surface states. At equilibrium coverage, 80% of the surface was covered by the linear state and the rest was equally shared by the bridge and twin states. The stability of these states to thermal desorption and oxidation is as follows: twin > linear > bridge. Self-sustained oscillations in the reaction rate and in linearly chemisorbed CO were observed with the same frequencies in a true kinetic regime. The region of oscillations was found to be intricately dependent on the system external variables such as gas phase temperature, inlet CO concentration in air, P/sub CO//P/sub $O_2$/ ratio in the inlet stream, and Pt surface to catalyst geometrical area ratio. Three distinctive reactor states were observed and were characterized as follows: time-invariant stable states, oscillatory states with well-defined periods and aperiodic or chaotic states. Oscillations were found to last for days without any catalyst deactivation effects. The oscillations were always observed around a region of maximum CO coverage. It is suggested that the competitive behavior around in the reaction steps through a Langmuir-Hinshelwood reaction mechanism could provide a driving mechanism for the oscillations.

# 42 ENGINEERING

## 4201 General Engineering

*REFER ALSO TO CITATION(S) 2189, 4244, 4245*

3060 **(UCRL-Trans—11918) Bending elasticity of circularly notched bars as monolithic flexure hinges in precision mechanisms.** Tanaka, M.; Nakayama, K. (National Research Lab. of Metrology, Sakura, Ibaraki (Japan)). 5 Nov 1983. Contract W-7405-ENG-48. Translation source information not available . 33p. NTIS, PC A03/MF A01. Order Number DE84002199.

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The elastic properties of a circular notched bar under bending load are treated by the theory of thin plates, by the theory

based on the rigorous solution of a hyperbolic notch and by the structural analysis of the finite element method respectively. The experimental results on the bending elastic coefficients verify these theoretical treatments not only in the thickness dependences on the geometrical parameters, but also in the absolute values with a difference of less than 20%. As far as the theoretical treatments are concerned, the geometrical average of the thickness of the notched bar and the radius of the circle are universally found to be the significant parameters in estimating the elastic properties. And also in the numerical analysis procedure, a systematic method to generate the elements in the circular notched bar is proposed, which will be a useful tool in further numerical analysis with the highest precision.

## 4202 Facilities And Equipment

*REFER ALSO TO CITATION(S) 1816, 1822, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 2035, 3122, 3123, 3246, 4162*

3061 (CONF-8305107—, pp 8-13) **Blast loading of closures for use on shelters.** Coulter, G.A. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The work reported here is a part of a study to upgrade existing shelters in key worker and host areas. Objective is to determine closures suitable for shelters in these two areas. Ultimate failure of closures (breakout) was determined by dynamic loading tests performed at the BRL 2.44 m blast simulator. Test results are given for three types of closures. Load ratios of ultimate failure to allowable static design loads were found dynamically to be about four for the wood beam/plywood skin closures. This would make it acceptable for both host and key worker shelter areas.

3062 (CONF-8305107—, pp 14-19) **DIRECT COURSE blast shelter entranceway and blast door experiments.** Kiger, S.A.; Hyde, D.W. (USAE Waterways Experiment Station, Vicksburg, MS). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The DIRECT COURSE Event is a planned high-explosive simulation of a 1-kt height-of-burst nuclear weapon. Three entranceway experiments will be fielded, one full size complete with two blast doors to document structural response and loading in the simulated 1-kit blast environment. Also, two 1/10-scale models, one double and one single entrance configuration, will be used to obtain blast pressure data that can be scaled to a 1-Mt blast environment. Results from these experiments will be used to evaluate and improve structural response calculations for the 1-kt environment, and to obtain loading data for a 1-Mt environment. These data will be used to design entranceways and blast doors for the key worker blast shelter.

3063 (CONF-8305107—, pp 20-26) **Tests and analyses of 1/4-scale upgraded nine-bay reinforced concrete basement models.** Woodson, S.C. (USAE Waterways Experiment Station, Vicksburg, MS). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Two nine-bay prototype structures, a flat plate and two-way slab with beams, were designed in accordance with the 1977 ACI code. A 1/4-scale model of each prototype was constructed, upgraded with timber posts, and statically tested. The development of the timber posts placement scheme was based upon yield-line analyses, punching shear evaluation, and moment-thrust interaction diagrams of the concrete slab sections. The flat plate model and the slab with beams model withstood approximate overpressures of 80 and 40 psi, respectively, indicating that required hardness may be achieved through simple upgrading techniques.

3064 (CONF-8305107—, pp 29-34) **Failure criteria for blast loads structures: a review.** Longinow, A.; Guralnick, S.A.; Mohammadi, J. (Illinois Inst. of Tech., Chicago). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

This paper briefly reviews the state-of-the-art of predicting the incipient collapse of structures subjected to blast loads and presents a suggested experimental and analytic, probability-based program capable of producing the required data and criteria by the use of full-scale tests and model studies. Emphasis of this review is on reinforced concrete structures. 45 references.

3065 (CONF-8305107—, pp 35-40) **Effects of multiple bursts on structural response.** Mohammadi, J. (Illinois Inst. of Tech., Chicago); Longinow, A.; Napandensky, H.S. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

A method was formulated for studying the probability of failure of structures when subjected to repeated blast loads. It was applied to the analysis of a structure subjected to a series of identical blast loads and several different ranges from ground zero. Results indicate that even as few as three repeated blast loads can significantly increase the probability of failure even for cases with a relatively high R/F. (The R/F ratio can be looked at as indicating the relative strength of the structure or as an indication of its range from the point of detonation).

3066 (CONF-8305107—, pp 114-119) **Reliability of engineered basements as blast shelters.** Longinow, A. (Illinois Inst. of Tech., Chicago); Mohammadi, J.; Robinson, R.R. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

A method for predicting the probability of failure of structures by considering multiple failure modes was formulated. It was applied to the analysis of a reinforced concrete slab when subjected to a uniformly distributed blast load over its surface. Currently available criteria for failure due to flexure and shear were used in predicting the probability of failure. This method is capable of considering all major components of a structure, the respective failure modes of each component, and of predicting the probability of failure of the structure as a whole.

3067 (CONF-8305107—, pp 120-125) **Reliability of residential basements as blast shelters.** Longinow, A.; Mohammadi, J. (Illinois Inst. of Tech., Chicago). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

This paper describes an analysis method for predicting the probability of failure of a wood-framed basement when subjected to a static, uniformly distributed load. The analysis considers the primary failure modes of each framing member and determines the probability of failure for each mode acting alone. The failure probability of the system as a whole is then bounded. The upper bound is determined on the assumption that the failure modes are independent, while the lower bound is determined on the assumption that the failure modes are perfectly correlated. The analysis is described with reference to an example problem.

3068 (CONF-8305107—, pp 126-131) **Design validation experiments for the key worker blast shelter.** Kiger, S.A.; Slawson, T.R. (USAE Waterways Experiment Station (WES), Vicksburg, MS). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Design calculations for the blast shelter included the effects of soil arching. In the past, soil arching has been ignored for dynamic loads at shallow burial depths; however, recent test data indicate structural loading is significantly reduced by arching, even at very shallow burial depths. The result is a more efficient structural design. Experiments to be conducted on 1/4-scale structural elements during June through October 1983 will provide loading and response design.

3069 (CONF-8305107—, pp 132-137) **Structural response of the SATCOM antenna to a blast loading.** Santiago, J.M.; Shehata, B.I. (Army Ballistic Research Lab., Aberdeen Proving Ground, MD). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The accuracy of the ADINA finite element program in modeling the transient response of a dish shaped antenna has been evaluated. Computed strain histories were compared with strain gage records from a simulated nuclear blast test performed on the antenna. With an 839 degrees-of-freedom finite element model, the program reproduced the salient features of the response, although a close correspondence between computed and test results was not realized. The study, however, did demonstrate that the model is sufficiently accurate for survivability estimates.

3070 (CONF-8305107—, pp 138-143) **Structural debris experiments at operation MILL RACE.** Rempel, J.R.; Beck, J.E.; McKee, R.G. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Structural debris patterns as determined by the mechanisms of building collapse under airblast loading have been studied experimentally at MILL RACE, White Sands, NM. Three near full-size buildings were instrumented to observe deflections, accelerations and air pressures and exposed to two different regimes of incident blast pressure produced by HE simulating 1 kt, viz., 10 and 3 psi; after the shot enough wall debris was located and identified to provide estimates of debris movement. Two of the test buildings were unreinforced, load-bearing masonry, one located at each of the two incident overpressures. The third building was made of reinforced concrete panels and was exposed to approximately 25 psi. Preliminary estimates of the effect of arching on debris energy and distribution are presented.

3071 (HTC—2M7-77) **Tool joint design and operating torque.** Farr, A.P. Jr.; Smith, T.B. (Hughes Tool Co., Culver City, CA (USA). Aircraft Div.). [nd]. 9p. (CONF-7603133—1). Hughes Tool Co., Aircraft Div., Culver City, CA.

From IADC rotary drilling conference; Dallas, TX, USA (9 Mar 1976).

Excess torque is involved in most premature failures of tool joints. This paper includes a discussion of the theoretical torsional strength of the drill pipe to which they may be attached. A review of five years of torsional failures in tool joints is presented and consideration is given to the effect of certain operating practices. Current tool joint bore and OD dimensions are reviewed in the light of field failures. It also covers a need to limit the input torque while drilling and suggests periodic checks to see if torsional limits have been exceeded.

3072 (SAND—83-2013C) **High-speed, low-altitude payload delivery using a single large ribbon parachute.** Johnson, D.W.; Peterson, C.W. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 21p. (CONF-8304129—1). NTIS, PC A02/MF A01. Order Number DE84002731.

From 8. AIAA conference on aerodynamic decelerator and balloon technology; Hyannis, MA, USA (2 Apr 1983).

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A 46.3-ft-dia 20-degree conical ribbon parachute has been designed to retard a 2200-lb payload delivered at speeds up to 800 KCAS and at altitudes as low as 150 feet above ground level. The parachute uses both Kevlar and nylon materials, some of which were developed specifically for this parachute. The canopy design incorporates a patented construction geometry to minimize stress concentrations. A cluster of three 3.8-ft-dia ribbon parachutes is used to deploy the main parachute in the presence of severe aircraft flow field effects and large payload angles of attack. The results of over 30 full-scale flight tests indicate that fundamental limitations imposed by the dynamics of the air masses inside and behind the canopy determine the ultimate performance of a single large parachute when it is used at a release altitude of 150 ft.

3073 (UCRL—15496) **Value/impact of design criteria for cast ductile iron shipping casks.** (Transnuclear, Inc., White Plains, NY (USA)). 15 Jul 1983. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE84002775.

The ductile failure criteria proposed in the Base report appear appropriate except that stress intensity values, S/sub m/ should be based on lower safety factors and ductility should be added as a criterion. A safety factor for stress intensity, s/sub m/ of 4 is recommended rather than 3 on minimum ultimate tensile strength, S/sub u/ in accordance with ASME code philosophy of assigning higher safety factors to cast ductile iron than to steel. This more conservative approach has no impact on costs since the selection of wall thickness is controlled by shielding rather than by stress considerations. The addition of a ductility criterion is recommended because of the problems associated with the selection of appropriate brittle failure criteria and the potential for cast ductile iron to have extremely low elongation at failure. Neither a materials nor a linear elastic fracture mechanics (LEFM) approach appear to be viable for demonstrating the prevention of brittle failure in cast ductile iron shipping casks. It is possible that the analytic methods predict brittle failure because of extremely conservative assumptions whereas real casks may not fail. Model drop tests could be used to demonstrate containment integrity. It is estimated that a risk committment of at least $1,000,000 would be required for engineering, design, model fabrication and testing. Before taking such risks, a mechanism should be found to obtain concurrence from NRC that the results of the test would be acceptable. Probabilistic approaches or model testing could be used to demonstrate the acceptability of cast ductile iron casks from a brittle failure point of view. Before probabilistic methods can be used, the NRC would have to be persuaded to accept the approach of the Competent Authority in West Germany or more formalized methods for probabilistic risk assessments.

3074 **Two-dimensional imaging of hotspots in superconducting bridges by low-temperature scanning electron microscopy.** Eichele, R.; Freytag, L.; Seifert, H.; Huebener, R.P.; Clem, J.R. (Physikalisches Institut II, Universitaet Tuebingen, Tuebingen, Federal Republic of Germany). *Journal of Low Temperature Physics;* 52: No. 5, 449-496(1 Sep 1983). Contract W-7405-ENG-82.

Hotspots generated in a thin-film superconductor through dissipation of joule energy are imaged by scanning the sample with the electron beam of a scanning electron microscope equipped with a liquid He stage. The signal utilized for imaging is the change of the sample voltage caused by the beam irradiation. A theoretical analysis of the heat balance equation indicates that the voltage signal reaches a maximum at the hotspot boundaries where the temperature profile passes through the critical temperature value of the superconductor. The predictions of our theoretical model agree well with our experiments performed using films of pure Sn, $O_2$-doped Sn, and $O_2$-doped Al. The width of the signal peaks marking the hotspot boundaries is twice the thermal healing length of the film/substrate configuration.

3075 **Reusable tamper-indicating security seal.** Ryan, M.J. (to Dept. of Energy). US Patent 4,389,063. 21 Jun 1983. Filed date 23 Jun 1981. vp.

PAT-APPL-276611.

The invention teaches means for detecting unauthorized tampering or substitutions of a device, and has particular utility when applied on a "seal" device used to secure a location or thing. The seal has a transparent body wall, and a first indicia, viz., a label identification is formed on the inside surface of this wall. Second and third indicia are formed on the outside surface of the transparent wall, and each of these indicia is transparent to allow the parallax angled viewing of the first indicia through these indicia. The second indicia is in the form of a broadly uniform pattern, viz, many small spaced dots; while the third indicia is in the form of easily memorized objects, such as human faces, made on a substrate by means of halftone printing. The substrate is lapped over the outside surface of the transparent wall. A thin cocoon of a transparent material, generally of the same material as the substrate such as plastic, is formed over the seal body and specifically over the transparent wall and the second and third indicia formed thereon. This

cocoon is seamless and has walls of nonuniform thickness. Both the genuineness of the seal and whether anyone has attempted to compromise the seal can thus be visually determined upon inspection.

3076 **High field superconducting window-frame beam transport magnets.** Allinger, J.; Carroll, A.; Danby, G.; Devito, B.; Jackson, J.; Leonhardt, W.; Prodell, A.; Skarita, J. (Brookhaven Nat'l Lab, Associated Universities, Inc., Upton, NY 11973). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **16**: No. 3, 1348-1352(May 1983).

The window-frame design for high field superconducting beam transport magnets was first applied to two, 2 m long, 4 T modules of an 8° bending magnet which has operated for nine years in the primary proton beam line at the Brookhaven National Laboratory Alternating Gradient Synchrotron (AGS). The design of two 1.5 m long, 7.6 cm cold bore superconducting window-frame magnets, described in this paper, intended for the external proton beam transport system at the AGS incorporated evolutionary changes. These magnets generated a maximum aperture field of 6.8 T with a peak field in the dipole coil of 7.1 T. Measured fields are very accurate and are compared to values calculated using the computer programs LINDA and POISSON. Results of quench propagation studies demonstrate the excellent thermal stability of the magnets. The magnets quench safely without energy extraction at a maximum current density, $J = 130$ kA/cm$^2$ in the superconductor, correspoding to $J = 57.6$ kA/cm$^2$ overall in the conductor at $B = 6.7$ T.

3077 **A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport.** Smith, R.; Gonczy, J.; Kelly, A.; Kim, S.; Krieger, C.; Underwood, D.; Wallace, E.; Wiggins, K. (Argonne National Lab). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **19**: No. 3, 1362-1363(May 1983).

A superconducting quadrupole magnet has been fabricated and tested that generates a gradient of 60 T/m at a peak operating current of 1100 amperes. The cold bore of the magnet is 12.7 cm in diameter and 2.8 m long, and the unwanted field multipoles sum to 4 parts per thousand of the quadrupole field at a bore radius of 5.0 cm. The magnet operates safely without quench protection and peak coil temperatures following quenches deliberately induced at full field do not exceed 50 K. Testing at the design gradient of 50 T/m indicates a beam energy deposition quench threshold of approximately 5 mJ/cm$^3$.

3078 **Winding design study of superconducting 10 T dipoles for a synchrotron.** Ishibashi, K.; McInturff, A. (Fermi National Accelerator Lab., P.O. Box 500, Batavia IL, 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **19**: No. 3, 1364-1367(May 1983).

A comparative design study was made for windings of a superconducting 10 T dipole magnet, which could be used for a future large accelerator. Calculations were done for different magnet winding design types; given a few simplifying assumptions, their general magnetic and mechanical parameters were obtained. The four shell configuration seemed to show the most promise of all the magnet designs considered for a 10 T small aperture (5 cm) dipole magnet.

3079 **Design of an indirectly cooled 3-m diameter superconducting solenoid with external support cylinder for the Fermilab Collider Detector Facility.** Wands, R.; Fast, R.; Grimson, J.; Kephart, R.; Leung, E.; Mapalo, L.; Minemura, H.; Yamada, R. (Fermi Nat'l Accelerator Laboratory, P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **19**: No. 3, 1368-1371(May 1983).

A 3-m diameter, 5 m long superconducting thin solenoid with indirect cooling and an external support cylinder has been designed for the Fermilab Collider Detector Facility. An aluminum stabilized Nb-Ti superconductor produced by the extrusion with front tension (EFT) method is used. Radiation length for the solenoid is .831, and absorption length is .186.

3080 **Conical transducer for generation of acoustic waves in fluids.** Baer, R.L.; Khuri-Yakub, B.T.; Kino, G.S. (Edward L. Ginzton Laboratory, W. W. Hansen Laboratories of Physics, Stanford University, Stanford, California 94305). *Applied Physics Letters;* **42**: No. 7, 573-574(1 Apr 1983). Contract AT03-81ER10865.

A conical transducer has been developed as an extension of the edge-bonded transducer. Surface waves on the inside of a conical radiator are used to launch longitudinal waves in fluids. This transducer offers a broad bandwidth and low sidelobe levels.

3081 **American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material.** La Grange Park, IL; American Nuclear Society (1980). 14p. (ANSI/ANS—8.5-1979). American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525 $16.00.

This standard applies to the use of borosilicate-glass raschig ring as a neutron absorber for primary and for secondary criticality control in solutions containing $^{235}$U, $^{239}$Pu, and $^{233}$U. The chemical and physical environment, properties of the rings and packed vessels, maintainance inspection procedures, and criticality operating limits are specified.

## 4203 Lasers

*REFER ALSO TO CITATION(S) 2741, 3152*

3082 **(UCRL—15559-Vol.1) Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report.** (TRW Energy Development Group, Redondo Beach, CA (USA)). 30 Sep 1983. Contract W-7405-ENG-48. 26p. NTIS, PC A03/MF A01. Order Number DE84001682.

Portions are illegible in microfiche products.

The Photodetachment Neutralizer (PDN) concept utilizes a chemical oxygen iodine laser (COIL) system operating in the closed cavity mode which provides a well defined volume filled with laser light. The negative ion beam ($D^-$) interacts with the laser photons resulting in a neutralization by photodetachment. The produced neutral beam is used to heat fusion devices. The primary objective of the study reported was to assess a technology base of the PDN concept by performing the tasks of: mirror technology assessment, window engineering analysis/technology assessment, and COIL medium modeling with emphasis on PDN issues. (LEW)

3083 **(UCRL—15559-Vol.2) Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report.** (TRW Energy Development Group, Redondo Beach, CA (USA)). 30 Sep 1983. Contract W-7405-ENG-48. 251p. NTIS, PC A12/MF A01. Order Number DE84002328.

Portions are illegible in microfiche products.

The Photodetachment Neutralizer (PDN) concept utilizes a chemical oxygen iodine laser (COIL) system operating in the closed cavity mode which provides a well defined volume filled with laser light. The negative ion beam ($D^-$) interacts with the laser photons resulting in a neutralization by photodetachment. The produced neutral beam is used to heat fusion devices. The primary objective of the study reported was to assess a technology base of the PDN concept by performing the tasks of: mirror technology assessment, window engineering analysis/technology assessment, and COIL medium modeling with emphasis on PDN issues. (LEW)

3084 **(UCRL—15561) Improved solid-state laser sources. Final technical report, 2 June 1981-1 June 1982.** Byer, R.L. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 56p. NTIS, PC A04/MF A01. Order Number DE84002784.

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During the first program year we have demonstrated diffraction limited output of 600 mJ from an unstable resonator Nd:Glass slab geometry oscillator. We have investigated, in detail, slab geometry lasers and have verified by careful experiments all important

predictions of the slab theory. To date we have generated 10 J of output energy at 2.5 Hz from a single multimode, non-Q-switched, slab oscillator at 3.5% storage efficiency, 2% slope efficiency and 1.6% extraction efficiency. We have doubled and Raman shifted the Q-switched 600 mJ slab glass oscillator. We have extended the slab concept to Nd:YAG. Preliminary measurements show that the slab geometry eliminates thermal focusing and stress induced birefringence in Nd:YAG. We have demonstrated the advantages of the miniature pedestal growth technology by growing Eu:$Y_2O_3$ single crystal fibers in addition to Nd:YAG and sapphire single crystal fibers.

3085 **Interpretation of Livermore third-harmonic-generation experiments.** Craxton, R.S. (University of Rochester, Laboratory for Laser Energetics, Rochester, New York 14623). *Applied Optics;* **22**: No. 17, 2739-2742(1 Sep 1983). Contract AC08-80DP40124.

Third-harmonic-generation experiments at the Lawrence Livermore National Laboratory were recently reported by Linford et al. [Appl. Opt. 21, 3633 (1982)]. Here the theory pertaining to these experiments is discussed in detail. The Livermore results are shown to be in accordance with calculations using the harmonic-generation code MIXER, whose predictions of highly efficient frequency tripling were first confirmed experimentally at the University of Rochester using the Type II/Type II polarization-mismatch configuration. The Livermore experiments confirm the advantages of this configuration.

3086 **Combination ring cavity and backward raman waveguide amplifier.** Kurnit, N.A. (to Dept. of Energy). US Patent 4,389,617. 21 Jun 1983. Filed date 13 Mar 1981. vp. PAT-APPL-243309.

A combination regenerative ring and backward raman waveguide amplifier and a combination regenerative ring oscillator and backward raman waveguide amplifier which produce raman amplification, pulse compression, and efficient energy extraction from the $CO_2$ laser pump signal for conversion into a stokes radiation signal. The ring cavity configuration allows the $CO_2$ laser pump signal and stokes signal to copropagate through the raman waveguide amplifier. The backward raman waveguide amplifier configuration extracts a major portion of the remaining energy from the $CO_2$ laser pump signal for conversion to stokes radiation. Additionally, the backward raman amplifier configuration produces a stokes radiation signal which has a high intensity and a short duration. Adjustment of the position of overlap of the stokes signal and the $CO_2$ laser pump signal in the backward raman waveguide amplifiers alters the amount of pulse compression which can be achieved.

3087 **He-Ne laser in hollow cathode discharge.** Rozsa, K.; Janossy, M. (Central Research Inst. for Physics, Budapest (Hungary).); Howorka, F.; Kuen, I. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp 184-189 of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; STUDIA Studentenfoerderungsgesellschaft m.b.H. (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Considering the results of our investigations it can be seen that a simple single mode He-Ne laser can be built using a Cu hollow cathode discharge. The output power of such a laser can be several milliwatts, which is considerably higher than that of a conventional single mode He-Ne laser where the length of the tube is restricted to about 10 cm determined by the length of the laser resonator.

## 4204 Heat Transfer And Fluid Flow

*REFER ALSO TO CITATION(S) 1759, 3190*

3088 **(INIS-mf—8531) Detection of flow mixing processes using transmission methods in high-duty heat exchanging apparatus. Final report for the sub-project E6.** Seiffert, V. (Hannover Univ. (Germany, F.R.). Sonderforschungsbereich 61 Stroemungsprobleme in der Energieumwandlung). 1981. 138p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703595.

The COBRA-IIIC program modified by MIT has been further improved for verifying the experimental studies described in the thesis. This work has been accompanied by a review and modification of the relevant analytical equations. A mathematical relationship has been set up for the cross-mixing phenomenon of shearing flow in narrowest cross-section between two heating rods, the relationship being taken into account in the sub-channel analysis. Despite the very complex and superposing processes of the problem studied, the results obtained by the improved sub-channel analysis program using the nearly derived cross-mixing approach are quantitatively well confirmed by comparison with experimental data. Applying the improved sub-channel analysis program to describing the author's two-phase flow experiments (air-water and water-steam) with rod bundle geometries to be found in the literature, the cross-mixing approach presented in the thesis is shown to be reliable.

3089 **(UCRL—89923) Numerical solution to the steady state equation of transfer in azimuthally symmetric geometries.** Garelis, E.; Rudy, T.E.; Hickman, R.B. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 41p. (CONF-8310178—2). NTIS, PC A03/MF A01. Order Number DE84001781.

From 2. international conference and workshop on radiative properties of hot dense matter; Sarasota, FL, USA (31 Oct 1983).

GLAM is a working system that can be used to calculate the various moments for the time independent equation of transfer for azimuthally symmetric problems. In particular, due to its unique method of calculating the cut-off angles, GLAM provides accurate view factors that can be used in conjunction with heat transfer calculations. In addition, since GLAM uses an integral approach, accurate answers can be obtained for specialized problems.

3090 **Nucleate boiling in drag-reducing polymer solutions.** Paul, D.D; Abdel-Khalik, S.I. (Batelle-Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201). *Journal of Rheology;* **27**: No. 1, 59-76(Feb 1983).

Nucleate boiling curves for aqueous solutions of drag-reducing polymers have been measured experimentally. The polymers examined are a galactomannan polysaccharide (Galactasol 211), a polyacrylamide (Separan MGL), two polymers consisting of both acrylamide and acrylic acid monomers (Separan NP-10P and Separan AP-30), two polyethylene oxides (Aldrich No. 18202-8 and No. 18946-4), and three hydroxyethyl celluloses (Natrosol 250MR, 250HR, and 250HHR). The boiling curves have been measured using an electrically heated platinum wire submerged in a saturated pool of liquid at atmospheric pressure. Polymer concentrations corresponding to relative viscosities of 1.01, 1.04, 1.08, 1.16, and 1.32 have been tested. The observed changes in the nucleate boiling curves for polymer solutions are in qualitative agreement with those predicted by the Rohsenow pool boiling correlation. In particular, the temperature shifts in the boiling curves are predicted adequately based only on how the polymers change the solution surface tension and, more importantly, the solution viscosity. Drag reduction effects appear to be unimportant; hence, polymer type, molecular weight, and concentration are important only insofar as they affect solution properties. These results differ from those reported by earlier investigators for pool boiling of dilute polymer solutions on heated flat plates.

3091 **(DOE-tr—4002814) Effects of surface roughness of horizontal cylinders on heat transfer to air under conditions of natural convection.** Prasolov, R.S. Translated from *Inzhenerno-Fizicheskii Zhurnal ;* 4: No. 5, 3-7(May 1961). Contract AC02-83CH10093. 10p. NTIS, PC A02/MF A01. Order Number DE84002814.

Data from an experimental study on the effect of surface roughness on the heat transfer of horizontal cylinders during natural convection to air is presented in this work. It has been discovered that within a specified interval of the value criterion for (Gr Pr)/sub md/ the convective heat transfer for rough tubes was approximately 1.5 to 1.9 times greater than for smooth tubes.

## 4205 Materials Testing

*REFER ALSO TO CITATION(S) 2679, 2682*

3092 **(CEA-CONF—6585) Particular treatments in Eddy current technique. Application to the control of corrugated tubes.** (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Nov 1982. 10p. (In French). (CONF-8211107—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703757.

From 4. international symposium on development of investigation for metals; Saint-Etienne, France (23 Nov 1982).

When the testing of a given product shows that, owing to a particular shape of this product or to its environment, disturbing effects can hide the presence of harmful defects, use must be made of testing artifices or particular treatments enabling an efficient examination to be made. On this score, many eddy current problems are solved by means of the following processes: - use of specific sensors adapted to the geometry of the product, - spectral analysis of the analog results of analyses, - combination of the results of analyses obtained simultaneously at different frequencies (multifrequency techniques). An example of an application is given for corrugated tubes achieved by hollow and helical milling of smooth tubes.

3093 (CONF-8305107—, pp 99-111) **Flammability testing state-of-the-art.** de Ris, J. (Factory Mutual Research Corp. Norwood, MA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Traditional material flammability tests are discussed in terms of their empirical foundation and oversimplified interpretation of fire phenomena. More recent rate-of-heat-release tests overcome some of these problems by measuring a material's response to different levels of fire exposure. However, no existing small-scale tests are sensitive to the radiant emission from the material's own flames. This radiant emission controls large-scale fire hazards. As a result, existing flammability tests cannot be expected to adequately characterize large-scale hazards. Some new approaches to this problem are discussed and a specific bench-scale test method is suggested which may overcome the identified problems of existing test methods. 4 figures.

3094 **(HEDL-SA—2984-FP) Design and use of nonstandard tensile specimens for irradiated materials testing.** Panayotou, N.F.; Atkin, S.D.; Puigh, R.J. (Hanford Engineering Development Lab., Richland, WA (USA)). Aug 1983. Contract AC06-76FF02170. 16p. (CONF-8309170—4). NTIS, PC A02/MF A01. Order Number DE84001468.

From Symposium on the use of nonstandard subsized specimens for irradiated testing; Albuquerque, NM, USA (23 Sep 1983).

Two types of miniature specimens been developed to utilize the limited irradiation volume of high energy neutron sources such as the Rotating Target Neutron Source (RTNS)-II and the Fusion Materials Irradiation Test (FMIT) facility. Wire-type specimens have been used to obtain tensile data for several metals irradiated at RTNS-II. Difficulties in the control of wire specimen dimensions led to the design of a miniature tensile specimen which could be fabricated from 0.25 mm thick sheet stock. Sheet-type tensile specimens are currently our standard tensile specimen for high energy neutron source experiments. These specimens are fabricated, like transmission electron microscopy (TEM) disks, by a punching technique. Precise test frame alignment is essential if reproducible test data are to be obtained. The dedicated test frame developed for miniature tensile specimen testing is briefly described. Miniature tensile specimens of a range of metals have been fabricated and tested. The data are reproducible and are in good agreement with data obtained from larger specimens.

3095 (INIS-BR—79, pp 249) **System for surface multiple analysis in the IFUNAM (Mexico).** Oliver, A.; Mercado, F.; Cota, L. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

An experimental set-up for a test chamber using several techniques such as ion, photon and electron spectroscopy is discussed for the physical property study of surfaces. (L.C.).

3096 (INIS-mf—8473, pp 305-309) **Development of acoustic leak detection in a primary cooling system.** Watanabe, K.; Uchikawa, T.; Kitahara, T.; Shiba, K. (Power Reactor and Nuclear Fuel Development Corp., Oarai, Ibaraki (Japan). Oarai Engineering Center). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Developments have been made on quick and early leak detection, especially for pressure-tube-type reactors, using acoustic emission (AE) sensors. Laboratory experiments have been conducted to clarify characteristics of AE associated with leakage of water at 7 MPa and approximately 280°C. In parallel with the experiments, noisy AEs have been measured on inlet feeder piping of the FUGEN reactor under normal reactor operation. Signal levels for leaks through circular holes increase proportionally with the square root of leak rate. The signal levels for leaks through circumferential cracks, however, show somewhat complicated characteristics, and are approximately 4 - 7 dB higher than the corresponding values for leaks through circular holes for a given leak rate. An asbestos heat insulator reduces the signal levels by approximately 13 dB. The signal levels decay in a simulated inlet feeder pipe, rapidly at first and exponentially at the rate of 1.16 +- 0.06 dB/m after a distance of 1 m from a leakage point. The insulator does not affect these attenuation characteristics. The level of continuous noisy AEs under power operation is lower than electronic noise level of 5 $\mu$Vsub(rms). On the other hand, burst-type noisy AEs with large amplitude ($<$ 2.5 mV) but short duration time ($<$ 1 sec) are frequently detected during the heatup or cooldown process.

3097 **(IS—4838) Review of progress in quantitative NDE.** (Ames Lab., IA (USA)). 1983. Contract W-7405-ENG-82. 216p. (CONF-830811—Absts.). NTIS, PC A10/MF A01. Order Number DE84001906.

From Conference on quantitative NDE; Santa Cruz, CA, USA (7 Aug 1983).

This document consists of approximately 180 one-page abstracts of the papers presented at the meeting. (DLC)

3098 **(JAERI-M—82-068) Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method.** Matsumoto, Masakatsu; Yamauchi, Isamu; Kodaira, Tsuneo. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 20p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703759.

The direct current (d.c.) electrical potential method was used to automatically and continuously measure the crack length in cyclic crack growth test at elevated temperature. This report describes some results concerning the calibration curves, i.e. the relation between electrical potential change and amount of crack extention, using SUS 304 and 2 1/4Cr-1Mo steels. It can be concluded that the measurements of fatigue crack length is possible even at elevated temperature as well as at room temperature with the equivalent accuracy.

3099 **(JAERI-M—82-082) Development of an apparatus for testing fatigue of metals at elevated temperatures in controlled environments.** Tsuji, Hirokazu; Kondo, Tatsuo. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 27p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703760.

A new fatigue test apparatus was developed for the purpose of performing well-defined tests in the application of structural materials at very high temperatures in precisely controlled chemical environments. Reviewing critically the two earlier exploratory attempts of designing, constructing and testing in simulated VHTR coolant environment, a modified design philosophy was established. In the latter particular care was taken to avoid unnecessary reactions of the machine's structural components and/or outgassing from any of the instruments or sealing. To fulfill such requirements, the apparatus was given the following features; 1) Hot portion is limited to the specimen only by employing induction heating with properly designed coils so that unexpected consumption of the impurities in the helium environment is prevented. 2) LVDT (Linear Variable Differential Transformer) is sealed with stainless steel and all gaskets used are of OFHC copper so that any undesirable outgassing is avoided. 3) Through those modifications tests both in vacuum of $10^{-9}$ Torr and in helium with very closely controlled impurity chemistry have been made possible. 4) An automatic data acquisition system with a computer is attached for accumulation of data throughout the test period, their analysis and display. Some preliminary test results are demonstrated to justify the design methodology employed.

3100 **(OEFZS-A—0404) Investigations on the monitoring of structural integrity and fault location for civil engineering prestressed concrete structures by acoustic emission analysis.** Hick, H.; Schmeskal, T.; Schwara, R.; Zagiczek, S.; Werbik, C.; Nemet, J.; Gangl, M.; Recker, R. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. vp. (In German). (PH—365/83). OEFZS, A-2444 Seibersdorf, Austria.

Acoustic emission measurements were performed in the laboratory on samples of rock, concrete and prestressed concrete components in order to investigate the applicability of acoustic emission analysis to the monitoring of structural integrity and the location of faults in prestressed concrete civil engineering structures. In addition acoustic emission measurements were also performed on leaks in pressurized pipes, again in view of a practical application for monitoring and fault location. The experimental results show, that under suitable conditions monitoring and fault location is possible for buildings and pressure lines. The main condition is the absence of too strong interfering acoustic disturbances, which is easily met in the laboratory but requires further study for field applications.

3101 **(SAND—83-1900) Automated 2-D thermal model to predict temperatures in the material stack of a thermal comparator test device.** Sisson, C.E. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1983. Contract AC04-76DP00789. 96p. NTIS, PC E05/MF A01. Order Number DE84002306.

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This report describes an automated thermal modeling capability which was developed for a thermal comparator test device used by the Thermophysical Properties Division at Sandia to measure the conductivity of various material samples. The thermal model provides a numerical capability to help evaluate potential errors in the material thermal conductivity values determined from test measurements. Such errors might occur when the material being tested has a low conductivity (possibly lower than the test device insulation material) causing heat to flow around the sample (shunting through the insulation). The thermal model allows analysis of the effects of variations in material stack dimensions, material properties, boundary conditions, and sample interface resistance.

3102 **(UCRL—89298) Maximum entropy reconstruction of a volume anomaly from pulse scatter data.** Bevensee, R.M. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 10p. (CONF-830811—18). NTIS, PC A02/MF A01. Order Number DE84002463.

From Conference on quantitative NDE; Santa Cruz, CA, USA (7 Aug 1983).

The Boltzmann (non-Burg) Maximum Entropy method is applied to the problem of inferring the shapes of extremely underdetermined volume anomalies from scattered waves on the incident (plane) wave side of the volume probed. The relevance of the entropy concept for this problem is shown. The efficacy of two versions of the method (radiating source and ray path) is indicated by two-dimensional synthetic-data problems involving only scalar wave displacement and no shear/compressional wave mixing.

3103 **(UCRL-Trans—11916) Investigations of the mechanical behavior of spot welded joints by means of acoustic emission analysis.** Crostack, H.A. (Lawrence Livermore National Lab., CA (USA); Dortmund Univ. (Germany, F.R.)). 5 Nov 1983. Contract W-7405-ENG-48. Translation of German Dissertation, 9 January 1976. 193p. NTIS, PC A09/MF A01. Order Number DE84003041.

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The investigations carried out on the mechanical behavior of spot-welded joints give information about the separate stages of the failure and determine the magnitude of the influencing parameters. In this way the strength of the joints can be raised. In addition to the acoustic emission analysis and metallographic and electron-optical investigations to establish the crack development, interpretation is also based on fracture mechanics and the variations in the internal stresses. With the aid of these procedures, it proved possible to construct a model which is able to explain the various failure patterns of a spot-welded joint under shear-tension loading. (LEW)

## 4206 Safety Engineering

*REFER ALSO TO CITATION(S) 1846, 2315*

## 4207 Vacuum Engineering

3104 **(LA—9849-MS) Fabrication of a hermetically sealed connector.** Idzorek, G.C.; Atencio, L.G. (Los Alamos National Lab., NM (USA)). Oct 1983. Contract W-7405-ENG-36. 3p. NTIS, PC A02/MF A01. Order Number DE84002322.

This report presents a technique for constructing a vacuum-tight, ribbon-cable bulkhead connector.

3105 **Temporary support for a UHV sample manipulator during bakeout.** Hess, B.V.; Felter, T.E. (Sandia National Laboratories, Livermore, California 94550). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* **1**: No. 4, 1874-1874(Oct 1983).

It is suggested that during bakeouts, XYZ translational stages be retrofitted with hardware that supports the bellows.

## 4208 Electronic Circuits And Devices

*REFER ALSO TO CITATION(S) 1816, 2874*

3106 **(SAND—83-2298C) Second-order adaptive infinite impulse response filter.** Ahmed, N.; Hush, D.; Elliott, G.R.; Fogler, R.J. (New Mexico Univ., Albuquerque (USA); Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 7p. (CONF-8310194—2). NTIS, PC A02/MF A01. Order Number DE84001768.

From Asilomar conference on circuits, systems and computers; Pacific Grove, CA, USA (31 Oct 1983).

A simple second-order infinite impulse response (IIR) filter is introduced. An efficient algorithm to use it as a line enhancer and tracker is presented. The related experimental results demonstrate that it can be used very effectively to enhance and track a single or dominant sinusoid in broadband noise.

3107 **(UCID—19918) Numerical electromagnetics code - method of moments. User's guide supplement for NEC-3 for modeling buried wires.** Burke, G.J. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE84002195.

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NEC-3 is a version of the Numerical Electromagnetics Code - Method of Moments that has been extended to model wires that are buried or penetrate the ground-air interface. Fields in the presence of an interface are obtained by interpolation or least-squares approximation using tables generated by an auxiliary program SOMNTX which evaluates Sommerfeld integrals. Asymptotic approximations for the field are used at larger distances. This approach is similar to that used in NEC-2 for wires above the interface, but now includes reflected field below the interface and field transmitted across the interface. NEC-3 retains all of the capabilities of NEC-2, and input data for NEC-2 should run with NEC-3 without change. NEC-3 requires about 14 percent more computer memory than NEC-2, however, so it may be worthwhile to retain a copy of NEC-2 for models not involving buried wires. This manual supplements the NEC-2 Users Guide and covers new features of NEC-3 and modifications to old options. The capabilities of NEC-3 and considerations for modeling buried wires are discussed. One new data card (UM) has been added and some options have been changed for other cards. Use of the program SOMNTX to generate the Sommerfeld integral tables for NEC-3 is discussed, followed by examples of modeling an antenna on a ground stake and a buried ground screen.

3108 **(UCRL—88672) Inexpensive solid-state trigger unit for thyratrons.** Fulkerson, E.S. (Lawrence Livermore National Lab., CA (USA)). Jun 1983. Contract W-7405-ENG-48. 5p. (CONF-830621—45). NTIS, PC A02/MF A01. Order Number DE84001424.

From IEEE power electronics specialists conference; Albuquerque, NM, USA (6 Jun 1983).

An SCR based unit suitable for triggering thyratrons has been developed. It is capable of developing over a kilovolt peak into a 50 ohm load with a risetime of under ten nanoseconds. Both grounded grid and common cathode styles of thyratrons may be driven with minor circuit changes. Jitter characteristics show less than half a nanosecond peak to peak, and a standard deviation less than 100 picoseconds has been obtained.

3109 **Wafer-scale laser pantography: Fabrication of n-metal-oxide-semiconductor transistors and small-scale integrated circuits by direct-write laser-induced pyrolytic reactions.** McWilliams, B.M.; Herman, I.P.; Mitlitsky, F.; Hyde, R.A.; Wood, L.L. (Department of Physics, University of California, Lawrence Livermore National Laboratory, Livermore, California 94550). *Applied Physics Letters;* **43**: No. 10, 946-948(15 Nov 1983). Contract W-7405-ENG-48.

A complete set of processes sufficient for manufacture of n-metal-oxide-semiconductor (n-MOS) transistors by a laser-induced direct-write process has been demonstrated separately, and integrated to yield functional transistors. Gates and interconnects were fabricated of various combinations of n-doped and intrinsic polysilicon, tungsten, and tungsten silicide compounds. Both 0.1-μm and 1-μm-thick gate oxides were micromachined with and without etchant gas, and the exposed p-Si [100] substrate was cleaned and, at times, etched. Diffusion regions were doped by laser-induced pyrolytic decomposition of phosphine followed by laser annealing. Along with the successful manufacture of working n-MOS transistors and a set of elementary digital logic gates, this letter reports the successful use of several laser-induced surface reactions that have not been reported previously.

3110 **GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications.** Zipperian, T.E.; Dawson, L.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **54**: No. 10, 6019-6025(Oct 1983). Contract AC04-76DP00789.

Useful bipolar transistor action over the temperature range from -195 to 550 °C has been demonstrated for heterojunction bipolar transistors in the GaP/AlGaP chemical system. This represents the highest temperature at which useful bipolar solid-state transistor action has ever been demonstrated in any material. Improvements in the materials technology and in the understanding of device characteristics at high temperatures were essential to the successful fabrication of these devices. These results demonstrate that the GaP/AlGaP heterojunction system is an excellent technology for active electronic components operated at high temperatures.

## 4209 Waste Processing Plants And Equipment

*REFER ALSO TO CITATION(S) 2656*

3111 **(NP—3770425) Theoretical and experimental investigations on dust separation in assemblies of perforated metal sheets.** Ondèrka, G. (Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 13 Jul 1982. 150p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83770425.

Pressure drop and separation behaviour for perforated sheets and assemblies of sheets are investigated in a testing plant. In the theoretical part impact degrees of particles were calculated. Motion equations for particle motion were set up. The differential equations could be solved numerically. In the experimental part the following parameters were investigated: number of plates ($1 <= n <= 15$), raw gas capacity, distance of plates, filter covering, blowing in velocity. As testing dust grinded limestone was used in 4 different fractions. With optimal parameters separation degrees of 99% at pressure drops of 1.5 kPa could be obtained. The two most important parameters are the aperture velocity and the particle magnitude of the dust. Both are contained in the Stokes number which is the real main variable.

3112 **(Y/DZ—77) Pilot-plant studies for solvent extraction of polychlorinated biphenyl (PCB).** Hancher, C.W.; Saunders, M.B. (Oak Ridge Y-12 Plant, TN (USA)). Dec 1983. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE84002171.

Polychlorinated biphenyls (PCB) in transformer-type oils were removed in pilot-plant studies using a solvent extraction process. The pilot plant contains two extraction columns (each 10 cm in diameter and 4.6 m long), plus other related equipment. Using counter-current flow, the solvent, dimethyl formamide (DMF), reduced 300-ppM-PCB oil to less than 50-ppM-PCB oil; a distribution coefficient of 1.5 (solvent/oil ratio) was in agreement with previous data obtained in laboratory tests. The addition of water to the DMF phase destroys PCB polar bonding and concentrates the PCB in a minimal oil volume. The DMF can be distilled from the water for recycle to the solvent extraction process.

## 4210 Combustion Systems

3113 **(DOE/ET/10393—1461) Fluidised-bed combustion project, Grimethorpe Experiment Facility: materials monitoring and evaluation plan for Test Series 2.** (NCB (IEA Grimethorpe) Ltd., Barnsley, South Yorkshire (UK)). 12 May 1983. Contract AI01-76ET10393. 41p. NTIS, PC A03/MF A01. Order Number DE83015484.

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The materials programme for Test Series 2 is envisaged to consist of three sub-programmes which together will obtain experimental performance data on the rates at which selected materials and components degradate during service in a pressurised fluidised bed combustion system when operating with different fuel and sorbent types. The three sub-programmes entail the materials evaluation of (a) corrosion probes/pins within the fluidised bed, (b) cascade blade test loop and (c) plant component monitoring and failure analysis. The results of the Test Series 2 materials programme will provide significant information to characterise the potential of various materials and components in pressurised fluidised bed combustion systems.

3114 **(DOE/PC/30185—T1) Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981.** McHale, E.T.; Scheffee, R.S.; Rossmeissl, N.P. (Atlantic Research Corp., Alexandria, VA (USA)). Apr 1981. Contract AC22-80PC30185. 22p. NTIS, PC A02/MF A01. Order Number DE84002126.

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Milling studies are continuing with the Kentucky coal. Dry milling studies have been completed and wet ball milling is being evaluated. Results to date show that wet milling yields much greater grinding rates. Since the mill base does not have to be dried prior to use, the economics of wet milling are superior to dry milling. A new diffuser for secondary air injection was designed and installed in the furnace. Significant improvement in combustion efficiency was realized, with a gain of at least 10% in the 20 to 30% excess air range with a medium volatile coal slurry. On the upgrading of facilities, the installation of the Spencer turbine blower was completed. The stack gas analysis and isokinetic sampling system was installed and tested. Work also progressed on the installation of several safety interlock systems.

3115 **(DOE/PC/30185—T2) Development and evaluation of coal-water mixture combustion technology. Phase I. Second quarterly report, 11 January 1981-10 April 1981.** McHale, E.T.; Scheffee, R.S.; Rossmeissl, N.P.; Boyd, T.J. (Atlantic Research Corp., Alexandria, VA (USA)). Jun 1981. Contract AC22-80PC30185. 47p. NTIS, PC A03/MF A01. Order Number DE84002123.

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Emphasis in the work reported was placed on slurry formulation technology and grinding studies. A description of a processing development unit is given. Evaluation of dispersants has been completed and shows that anionics that do not reduce surface tension are most effective in reducing viscosity. Evaluation of laboratory wet ball milling of Kentucky coal was continued. This work shows that size reduction rate increases with decreasing coal content in the mill base. Dry milling by means of a hammermill has been found to yield a good particle size distribution curve for preparation of highly loaded slurries by running the mill at minimum speed with minimum grate size. A pilot laboratory slurry at a nominal rate of 1 bbl/hour is operational and a flow chart is shown. Some relevant cost considerations are also presented for slurry production. (LEW)

3116 **(MINTEK-M—48) Tracer tests on furnaces at Metalloys Limited.** Smith, D.J.; Wedepohl, A. (Council for Mineral Technology, Randburg (South Africa)). 14 Jan 1983. 63p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704294.

During 1980, thirteen double tests were carried out with five radioactive isotopes on three furnaces at Metalloys Limited, near Meyerton. Each double test involved the introduction of a sample of coke impregnated with lanthanum and a sample of irradiated manganese ore ($^{54}$Mn or $^{59}$Fe), irradiated quartzite ($^{46}$Sc), or irradiated coal ($^{46}$Sc, $^{59}$Fe, and $^{60}$Co). The tests were conducted on the three large furnaces for the production of high-carbon ferromanganese, viz M10, M11, and M12. The radioactivity of samples of the metal and the slag leaving the furnace was measured by the Isotopes and Activation Division of the Atomic Energy Board (AEB). Response curves and computer analyses are presented on the elution of the tracers from the furnaces. The response curves for the tracers, which were inserted close to the electrodes, are discussed so that the salient differences between their passage through the three furnaces can be established. The results obtained give support to the findings of a dig-out carried out on furnace M10 during 1977. The metal and slag products of furnace M12 were subjected to mineralogical investigation so that the major phases in the furnace products could be determined. Details of the calculation of the mean residence time for material in furnace M12 are given in an appendix.

3117 **(NE/FBA—83-5) Final report on fluidized bed materials. Stage 4.** Holm, T.; Engman, U. (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). Jan 1983. 138p. (In Swedish). (STUDSVIK-EI—83-17). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751424.

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During the fourth part of the projects Fluidized Bed Materials components and materials exposed in swedish fluidized beds have been analyzed. The experiences gained during the whole project are summarized and form together with a litterature review the base for the following conclusions: Erosion damages are observed primarily in fast circulating fliudized beds. In slow bubbling beds erosion is observed in some cases and is probably caused by locally high particle velocities in the bed. The rate of high temperature corrosion is significantly higher within the bed compared to within the freeboard. Sulfidation, which gives high corrosion rates, is increased due to the low oxygen partial pressure and by sulfur deposition within the bed. Gasification gives even higher corrosion rates compared to combustion due to high temperature sulfidation. Full scale fluidized beds for combustion will be built in the near future. Continuing analyses of components and materials exposed in these plants are needed.

## 4230 Marine Engineering

*REFER ALSO TO CITATION(S) 1844, 1845*

## 4240 Pollution Control Equipment

*REFER ALSO TO CITATION(S) 1951, 1952, 2652, 3105*

3118 (IAEA-SR—72, pp 90-100) **Trends and developments for in-situ testing of HEPA filters.** Dorman, R.G. May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/36).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Many on-site tests are mainly tests of holes or sealing leaks as they employ heterodisperse clouds of particles, significant fractions of which are too large for penetration of intact HEPA filters. If it can be assumed that the filter material, when intact, is of high efficiency towards submicrometre particles, it is at least arguable that these types of test are adequate and that laboratory or factory rig tests are unnecessary. For detection of holes in systems the aerosol size is relatively unimportant and it is found in practice that different size distributions give similar results. There is, however, likely to be a need for on-site tests which give a true value - that is, of filter penetration plus leakage - when the system is challenged with submicrometre aerosols. An example appears to be in processing plutonium. We may therefore address ourselves to two types of on-site assessment. Firstly to search for holes (leakages) and secondly to measure the passage of submicrometre particles. Improvements in the first type are likely to be concerned with mixing and sampling of aerosols while the second, additionally, requires investigation into generation and detection methods. In all tests it is important that results are reliable. This involves thorough mixing of aerosol both upstream and downstream of the filter. Unfortunately few systems have been designed for ease of on-site tests and operators have to employ makeshift devices, often in cramped and uncomfortable situations. This paper gives examples of the need for mixing and sampling and of the penetration of intact filters by aerosols of different size distributions. Tests in common use are outlined, together with problems and likely developments.

3119 (IAEA-SR—72, pp 101-117) **Testing HEPA filter response to high flow velocity and overpressure.** Ruedinger, V.; Wilhelm, J.G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/15).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

In cooperation with the Los Alamos National Laboratory (LANL) HEPA filters presently on the market and modified versions were tested using the LANL blowdown facility. The filter response during the test was documented on high speed films which indicated, among other information, the load when first failure occurred and the failure mode. Differential pressure through the filter and velocity were measured with variable reluctance pressure transducers and an oscilloscope recorder. New HEPA filters show first failures already at differential pressures between some 4 kPa and 17 kPa. The better results are obtained with conventionally pleated filter paper packs sealed in a wooden frame with a polyurethane material. However, these filters cannot be used under accident conditions. Metal frame filters considered as potential filters for accident situations showed only poor resistance against overpressures. The weakest point in such filters proved to be the attachment of the filter pack in the metal frame, which limited the loadability to about 10 kPa. As soon as proper attachment is assured, the integrity of the filter pack limits the admissible differential pressure. Through some modifications of wood frame filters, physical integrity was improved to a failure pressure of 24 kPa. During operation, the filter elements are loaded with dust. Dust loading up to 1000 Pa pressure drop at rated flow, which was simulated with polystyrene latex aerosols, was found to reduce the mechanical stability by up to 40%. Pressure drop characteristics of HEPA filters influence the occurrence of high differential pressures and high mechanical loads. Pressure drops ($\Delta p$) of unloaded and preloaded filters were investigated up to high flow velocities (v). Measured data can be presented in the form of $\Delta p = av + bv^2$, where a and b are constants. Theory, in contrast, predicts a linear relationship.

3120 (IAEA-SR—72, pp 118-152) **Comparison of testing methods for particulate filters.** Ullmann, W.; Przyborowski, S. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/22).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Four testing methods for particulate filters were compared by using the test rigs of the National Board of Nuclear Safety and Radiation Protection: 1) Measurement of filter penetration P as a function of particle size d by using a polydisperse NaCl test aerosol and a scintillation particle counter; 2) Modified sodium flame test for measurement of total filter penetration P for various polydisperse NaCl test aerosols; 3) Measurement of total filter penetration P for a polydisperse NaCl test aerosol labelled with short-lived radon daughter products; 4) Measurement of total filter penetration P for a special paraffin oil test aerosol (oil fog test used in FRG according DIN 24 184, test aerosol A). The investigations were carried out on sheets of glass fibre paper (five grades of paper). Detailed information about the four testing methods and the used particle size distributions is given. The different results of the various methods are the base for the discussion of the most important parameters which influence the filter penetration P. The course of the function $P = f(d)$ shows the great influence of the particle size. As expected there was also found a great dependence both from the test aerosol as well as from the principle and the measuring range of the aerosol-measuring device. The differences between the results of the various test methods are greater the lower the penetration. The use of NaCl test aerosol with various particle size distributions gives great differences for the respective penetration values. On the basis of these results and the values given by Dorman conclusions are made about the investigation of particulate filters both for the determination of filter penetration P as well as for the leak test of installed filters.

3121 (IAEA-SR—72, pp 153-165) **Comparison of some particulate air filter testing methods used in normal and unfavourable conditions.** Hirling, J.; Gaal, J. (Magyar Tudomanyos Akademia, Budapest. Izotopintezete). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/23).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The results of the removal efficiency of HEPA filters obtained by various existing test methods are rather divergent, due to special features of the applied test aerosols, the sampling - and analytical methods etc. Further difficulties arise if the tested filters are operated in various unfavourable conditions, such as: high temperature, humidity, contaminant loading, presence of heavy aerosols etc. Three methods: DOP test, potassium flame - photometric test and the radioisotopic tracer-test developed in our Institute, were intercompared, using various well known filter media, at different air velocity. All the three experiments were carried out in the same equipment using different aerosol generation, sampling and analytical method in it consecutively. The main conclusions were that all the attained filter efficiency values have been found equivalent and they are correlated within the range of experimental errors. The resistance and other properties, i.e. particle size distribution, of the various test aerosols were studied from the point of view of their suitability at high temperature and in humid conditions. It was found that the arc-generated radioactive metal-aerosols proved to be rather successful for filter testing even in unfavourable conditions. They are also very good test-particles to model the filtration of heavy-metal vapours, i.e. alpha-emitting transurane elements.

3122 (IAEA-SR—72, pp 166-177) **Experience with a standardized method and application of the recent trends for in-situ testing of HEPA-filtration systems.** Deworm, J.P.; Slegers, W.; Pauwels, J.B. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/04).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The standardized DOP-method is used in Belgium for in-situ testing of HEPA-filtration systems of nuclear power plants and other nuclear applications. Since 1968, about 2.184 air-cleaning systems were tested in this manner, in different nuclear facilities. The results of these leak-testings were that 13% of the tested systems had a penetration greater than 0.05%. The main two leaking-faults were damaged gaskets (29%) or insufficient clamping (35%). Nevertheless 16% were owing to a defective filter medium and the remaining 20% from different causes. For the nuclear power plants the main leaking-fault came through by-passing (29%) and defective filtermedium (22%), leaking through gaskets was less important (13%). The size distributions are also important in the case that we try not only to test the leakage but also the efficiency of the air-cleaning system. Indeed measurement of the particle size efficiency can be of importance to regulatory agencies. This trend to transform the in-situ testing into an efficiency test was the reason to obtain experience with the intercavity laser single particle spectrometer. This method developed through B.G. Schuster and D.J. Oselek was applicated to our installations and our testing. "In-situ"-testing was performed with the laser intercavity spectrometer on the air cleaning systems in comparison with the standardized DOP-method. The results of these in-situ tests are summarized. The laser spectrometer is also an important method for testing in-situ HEPA-filters in serie. This method was further investigated on a testrig with two HEPA-filters in serie. On this testrig penetration less than $2.3.10^{-7}$ and $4.10^{-8}$ could be measured.

## 4250 Power Cycles

*REFER ALSO TO CITATION(S) 2548*

3123 (LA—9871-MS) **Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine.** Cloutman, L.D. (Los Alamos National Lab., NM (USA)). Sep 1983. Contract W-7405-ENG-36. 24p. NTIS, PC A02/MF A01. Order Number DE84002321.

The CONCHAS-SPRAY computer program has been used to simulate the compression stroke of an external-chamber Diesel engine. We predict that the strongest fluid motions in the external chamber occur at the time fuel is injected, the peak temperature is 7% below an idealized adiabatic prediction, and the peak pressure

is 10% lower. We also show an example of a simple procedure for generating grids for complex engine geometries.

3124 **Generalized Carnot cycle: A working fluid operating in finite time between finite heat sources and sinks.** Ondrechen, M.J.; Rubin, M.H.; Band, Y.B. (Department of Chemistry, Northeastern University, Boston, Massachusetts 02115). *Journal of Chemical Physics;* **78**: No. 7, 4721-4727(1 Apr 1983).

The production of work in finite time from a reservoir with finite heat capacity is studied. A model system, for which the only irreversibilities result from finite rates of heat conduction, is adopted. The maximum work obtainable in finite time from such a system is derived, and is found to be strongly dependent upon the reservoir heat capacity. The cycle producing the maximum work is derived for an arbitrary one-component working fluid; no equation of state is assumed. In the optimum cycle, when the working substance is in contact with a finite reservoir, then the temperature of the working fluid is an exponential function of time and the entropy of the working substance is a linear function of time. While the maximum work obtainable in a single fixed-time cycle is a strictly increasing function of the reservoir heat capacity, the efficiency (work produced/heat put in) is a strictly decreasing function of the reservoir heat capacity, for the model system with a finite hot reservoir and an infinite cold reservoir. In the limit where the reservoir heat capacity approaches infinity, the finite-time efficiency approaches the Curzon—Ahlborn efficiency eta = 1-(T°/sub low// T°/sub high/)/sup 1/2/ for the cycle which produces maximum power.

# 43 PARTICLE ACCELERATORS

## 4301 Design, Development, And Operation

*REFER ALSO TO CITATION(S) 3070, 3072, 3073*

3125 **(CAPE—2881) SLAC 5045 klystron (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 16 Sep 1983. Contract AC03-76SF00515. TIC, PO Bx 62, Oak Ridge, TN 37831.

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The drawings listed on the Auxiliary Drawing list provide a preliminary general outline and lead shielding components for the new 60 MW klystron. These drawings are preliminary and subject to change as the development of the klystron progresses. These new klystrons are part of the proposed energy upgrading of the linear accelerator for the new collider mode of operation.

3126 **(JINR—9-82-756) Cyclotron facility for acceleration of heavy ions to 20-120 MeV/nucleon.** Oganesyan, Yu.Ts.; Kolesov, I.V.; Gul'bekyan, G.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1982. 16p. (In Russian). (CONF-8210133—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703752.

From 8. All-Union conference on charged particles accelerators; Protvino, USSR (1 Oct 1982).

The cyclotron facility designed to accelerate ions of all elements of the Mendeleev Periodic Table to 20-120 MeV/nucleon energies is described. This facility consists of two isochronous cyclotrons with 4 m pole diameters, one of which (U-400) is an injector for the main accelerator (U-400M) to be built on the basis of the electromagnet of the classical cyclotron. Ion acceleration will be performed in two stages: at first, to 1.5-3 MeV/nucleon at the U-400 cyclotron, and then, after extraction and charge exchange to increase the ion charge by a factor of 4-8, at the main accelerator U-400M. The physicotechnical justification and the main parameters of the accelerator system are given.

3127 (LA—9798-P, pp 6-15) **Executive summary.** Silbar, R.R. (Los Alamos National Lab., NM); Sternheim, M.M. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A summary of the physics justification for LAMPF II is given. (WHK)

3128 **Some aspects of superconducting accelerator design.** Farkas, Z.; St. Lorant, S. (Stanford University, Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **19**: No. 3, 1338-1342(May 1983). Contract AC03-76SF00515.

The performance of an accelerator can be characterized by the efficiency with which electrical energy, ac and rf, is converted into accelerating energy, the minimum energy needed to generate a given beam voltage. The current accelerator improvement program at SLAC aims at raising the beam voltage to 50GV which will use 240 klystrons each capable of producing a pulse 5μs in length at a peak power of 36MW. The Linear Collider requires 50MW klystrons to achieve 6OGV which will raise the concomittant power consumption to 32.3MW. The authors show that with superconducting elements they can increase the rf and ac conversion efficiencies and achieve the necessary 60GV using only 1/3 of the present power requirements, provided that they exclude CW operation. They further demonstrate that this increase in efficiency is crucial and highly significant in the design of a proposed 1000GV linear accelerator.

3129 **Fermilab tevatron quadrupoles.** Cooper, W.; Fisk, H.; Gross, D.; Lundy, R.; Schmidt, E.; Turkot, F. (Fermi Nat'l Accelerator Lab, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics;* **19**: No. 3, 1372-1377(May 1983).

Details on the design, construction, and performance tests of Energy Saver/Doubler quadrupoles are presented along with recent data from the test of a special high gradient low beta prototype quadrupole.

3130 **Factors affecting the operating characteristic of the zetatron: a small neutron generator for borehole logging.** Berg, R.S.; Jacobs, E.L. (Tube Development Division, 2364 Sandia National Laboratories, Albuquerque, NM 87185). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1459-1462(Apr 1983).

The Zetatron is a small deuterium-tritium accelerator which uses a reflex discharge ion source and approximately 130 kV acceleration from a pulse transformer. The dominantly D(T,n) He reaction takes place in an occluder target consisting of a Scandium deuterotritide film deposited on a molybdenum slug. The instantaneous energy deposition rates at the target, the species present in the beam, and the beam profile determine target life and neutron output characteristics. The target temperatures are calculated for a single pulse and compared to measurements of the thermal profile on a specifically-prepared, thin-target substrate. Target images are shown which illustrate the beam imaging process. The beam is found to consist of an intense spot 2-4 mm in diameter surrounded by a halo approximately the size of the target. The implications of such a beam profile are discussed. Computer codes are used to model the beam and to describe the parts of the tube that control the beam characteristics.

3131 **Vane coupling rings: a simple technique for stabilizing a four-vane radiofrequency quadrupole structure.** Howard, D.; Lancaster, H. (Lawrence Berkeley Lab, Univ. of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1446-1448(Apr 1983). Contract AC03-76SF00098.

The benefits of stabilized accelerating structures, with regard to the manufacture and operation, have been well documented. The four-vane radiofrequency quadrupoles (RFQ) presently being designed and constructed in many laboratories are not stabilized because of the weak electromagnetic coupling between the quadrant resonators. This paper presents a simple technique developed at the Lawrence Berkeley Laboratory using vane coupling rings (VCR's) which azimuthally stabilize the RFQ structure and greatly enhance its use as a practical accelerator. In particular, the VCR's: Completely eliminate the dipole modes in the frequency range of interest; Provide adequate quadrant balance with an initial precision mechanical alignment of the vanes; Enhance axial balance and simplify

end tuners. Experimental verification tests on a scale model will be discussed.

3132 **Low energy positron production at the Livermore linac.** Howell, R.H.; Alvarez, R.A.; Dhawan, S.; Egan, P.O.; Hughes, V.W.; Ritter, M.W.; Woodle, K.A. (Lawrence Livermore National Lab, Livermore, CA 94550). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1438-1441(Apr 1983). Contract W-7405-ENG-48.

Beams of monoenergetic positrons with energies of a few eV to many keV have been used in experiments in atomic physics, solid state physics and materials science. The results of some of these experiments are given and the production of positron beams from a new source, an electron linac, is described. Intense, pulsed beams of low-energy positrons have been produced by a high-energy beam from an electron linac. The production efficiency for low-energy positrons has been determined for electrons with energies from 60 to 120 MeV. Low-energy positron beams produced with a high energy electron linac can be of much higher intensity than those beams currently derived from radioactive sources. These higher intensity beams will make possible positron experiments previously infeasable.

3133 **Electron linacs for laser and radiographic applications.** Stein, W.E. (Industrial Radiation, Inc., Los Alamos, NM 87544). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1434-1437(Apr 1983).

New electron linear accelerator configurations have been designed and a few have been constructed to satisfy the needs of unique laser and radiographic applications. In the laser applications, electron linacs are required that produce exceptional electron beam quality. For adequate gain in the free-electron laser experiments, 20-MeV electron beams with excellent emittance, low energy spread and high instantaneous current are essential. Similar beam quality from a 5-MeV linac will be required to provide high efficiency and high repetition rate pumping of KrF or XeF gases in future excimer lasers. For radiography, new electron linacs with a variety of energies and intensities are required for special applications. Two diverse examples of custom linacs that have been requested and for which conceptual designs have been completed are: 1) a 10-MeV linac operating with an x-ray dose rate of 3000R/min at 1m while being subjected to extreme centrifugal and vibrational forces, 2) a light weight, highly portable 8-MeV linac with a dose rate of about 200R/min at 1m for x-ray and possibly neutron radiography in adverse environmental conditions at remote locations. An unconventional linac configuration, the Klylac, has been studied both theoretically and experimentally. In the Klylac configuration, the Klystron and accelerator are arranged coaxially and in tandem. The same electron beam is used both to produce the rf power and as a source of electrons for acceleration. Internal coupling of the rf power from the Klystron section to the accelerator section could provide a compact, cylindrical structure of minimal diameter for special applications such as well logging.

3134 **Radiation safety systems at Brookhaven National Laboratory's low-energy accelerators.** Flood, C.W. Jr. (Safety & Environmental Protection Division, Brookhaven National Lab., Upton, NY 11973). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1597-1600(Apr 1983).

Brookhaven National Laboratory has several low-energy accelerators in use at the present time. I intend to discuss the radiation safety systems installed at five of these accelerators. The accelerators included are a Dynamitron, 3.5 MeV Van de Graaff, 60″ Cyclotron, 41″ Cyclotron and Tandem Van de Graaff facility. All of these accelerators are capable of producing radiation levels in excess of 100 rem/h and the radiation safety systems are designed to prevent personnel from being exposed to high levels of radiation. For the purposes of this talk I would like to place the accelerators in two different categories. In the first category are the accelerators which have safety systems that prevent operation unless the radiation facilities are completely enclosed and interlocked, thus preventing any personnel access. Included are the Dynamitron, the 60″ Cyclotron, and the 41″ Cyclotron. In the second category are the accelerators with safety systems which allow access to any part of the accelerator facility when the radiation levels are low, but require complete personnel restrictions when the radiation levels are high. Included are the 3.5 MeV Van de Graaff and the Tandem Van de Graaff. In addition to the different requirements for each category there are many requirements that are the same. These include: access to the accelerator area or target area must be controlled either by doors with interlocks or by light beams; inspection stations throughout the facility which must be activated before the accelerator can produce high radiation levels; scram buttons that when pushed will shut the accelerator down must be available in all active areas; and reinspection is required if an access interlock is violated or a scram button is pushed.

3135 **Advanced medical accelerator design.** Alonso, J.R.; Elioff, T.; Garren, A.; Gough, R.A.; Grunder, H.A.; Lancaster, H.; Magyary, S.; More, V. (Lawrence Berkeley Lab, University of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1762-1764(Apr 1983). Contract AC03-76SF00098.

This report describes the design of an advanced medical facility dedicated to charged particle radiotherapy and other biomedical applications of relativistic heavy ions. Project status is reviewed and some technical aspects discussed. Clinical standards of reliability are regarded as essential features of this facility. Particular emphasis is therefore placed on the control system and on the use of technology which will maximize operational efficiency. The accelerator will produce a variety of heavy ion beams from helium to argon with intensities sufficient to provide delivered dose rates of several hundred rad/minute over large, uniform fields. The technical components consist of a linac injector with multiple PIG ion sources, a synchrotron and a versatile beam delivery system. An overview is given of both design philosophy and selected accelerator subsystems. Finally, a plan of the facility is described.

## 4302 Beam Dynamics, Field Calculations, And Ion Optics

*REFER ALSO TO CITATION(S) 3071, 3126*

3136 **(DESY—83-005) Transverse beam cavity interaction. Pt. 2.** Weiland, T. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Feb 1983. 47p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751355.

Intense bunches of charged particles in accelerators excite transverse higher modes in accelerating cavities. These higher modes lead to an interaction between widely separated bunches. Such multi bunch or multi turn instabilities due to long range forces can be described by the cavity mode frequencies and field patterns. For structures of cylindrical symmetry a computer code named URMEL is described which calculates resonant modes of any azimuthal mode number m=0,1,2.. (monopole, dipole, quadrupole, etc.). The eigenfrequencies are found as linear eigenvalues of a large matrix and simple mathematical procedures guarantee that no modes are missed. The combined use of URMEL in frequency domain and of the complementary code TBCI in time domain enables a complete analysis of long range -low frequency- forces (narrow band impedances) and short range -high frequency- forces (broad band impedances).

3137 **(DESY—83-032) Simulation of electron spin depolarisation with the computer code SITROS.** Kewisch, J. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751354.

A new tracking program 'SITROS' which enables simulation of polarising and depolarising effects in electron-positron storage rings is presented. The effectiveness of the simulation is illustrated for the storage ring PETRA.

3138 **(JINR—9-82-709) Electron beam formation in the injection point in the adgezator of the electron-ring accelerator prototype.** Aleksandrov, V.S.; Dolbilov, G.V.; Perel'shtejn, Eh.A.; Razuvakin, V.N.; Sumbaev, A.P.; Tyutyunnikov, S.I.; Shalyapin, V.N.; Shirkov, G.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703751.

Electron beam parameters are studied on the SILUND accelerator with the 300-350 A current and 1.7 MeV electron energy. The space characteristics of the beam are measured in the adgezator injection point by the two-coordinate discrete probe. The beam crossover with the r.m.s. radius of 0.9-1.0 cm is formed by changing the strength and geometry of focusing fields. The beam emittance is obtained (50 cm mrad) by the slit method and envelope analysis. The emittance changing following the beam propagation through thin foils was studied.

3139 **(JINR—R-9-82-640) Effect of diaphragms on the electron beam stability in an induction linear accelerator.** Aleksakhin, Yu.I.; Perel'shtejn, Eh.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703754.

The effect of shielding of electron beam electromagnetic field by sequence of metal diaphragms used in linear induction accelerator to protect the accelerator tube, on the stability of the beam transverse motion is considered. The strength of the longitudinal magnetic field needed for the beam coherent focusing is determined. The sequence of diaphragms is shown to form a moderating structure, in which asymmetric hybride wave can propagate. The growth rate of the beam high-frequency oscillations coupled with the moderated wave in the structure is found.

3140 **(JINR—R-9-82-675) Specificities of magnetic field formation in the adgezator of a collective accelerator model.** Viktorov, Yu.B.; Zhabitskij, V.M.; Ivanov, G.A.; Ivanov, I.N.; Kaminskaya, A.M.; Kaminskij, A.K.; Rashevskij, V.P.; Sergeev, A.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703755.

The main modes of operation of a collective accelerator model have been presented. The problem of decreasing the influence of the magnetic field (Tsub(imp) = 30 μs) of the 6th stage localized outside of adgezator chamber, on the parameters of the electron ring, has been considered. B-shielding has been obtained. B-component of this field decreased by the factor of 5-10. The compensation system of the residual field of the 6th stage, allowing to decrease the remainder field by the factor of 30-40 more, has been selected and tested. It has prevented the beam losses at the initial stage of the ring formation at the 6th stage switching.

3141 **(JINR—R-9-82-676) Magnetic field formation at the electron ring extraction from the collective accelerator model.** Viktorov, Yu.B.; Golubev, I.I.; Ivanov, I.N.; Kaminskaya, A.M.; Kaminskij, A.K.; Lachinov, V.M.; Makoveev, V.K.; Mamonov, V.N.; Rashevskij, V.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703756.

The problems of magnetic field formation in a collective accelerator model are considered. An excellent agreement of the calculated and measured magnetic field distributions in a thick-walled metallic chamber at the separate switching of the magnetic system stages is indicated. Their effect over each other at the joint work is considered. The construction of vacuum current lead providing sufficient electric and mechanical strength of the coils is presented. A few distributions of the magnetic field in the region of the ring extraction that expand the possibilities of investigations of the electron-ion rings, have been experimentally obtained.

3142 **(KFKI—1983-21, pp 183-191) Effect of third order discretized resonances (2νsub(z)-νsub(x)=1) upon the movement of particles in cyclic accelerators.** Amirkhanov, I.V.; Zhidkov, E.P.; Zhidkova, I.E. (Joint Inst. for Nuclear Research, Dubna (USSR)). Mar 1983. (In Russian). NTIS (US Sales Only), PC A09/MF A01.

In Collection of scientific papers in collaboration with Joint Institute for Nuclear Research, Dubna, USSR and Central Research Institute for Physics, Budapest, Hungary. Algorithms and programs for solution of some problems in physics.

Nonlinear resonances appearing in investigations of beam dynamics in cyclic accelerators render the choice of working point of the system because of the presence of nonlinear resonances of sufficiently high order arbitrarily close to each chosen point. This fact stimulated the detailed investigation on the effect of resonances to the motion of beam particles. A resonance of third order was investigated in the second approximation. Some questions of computer calculations are disscussed.

3143 **(UCRL—88921) Time-resolved beam-profile measurements on the Experimental Test Accelerator (ETA).** Chong, Y.P.; Lauer, E.J.; Clark, J.C.; Slaughter, D.R.; Fessenden, T.J. (Lawrence Livermore National Lab., CA (USA)). 22 Sep 1983. Contract W-7405-ENG-48. 7p. (CONF-830911—34). NTIS, PC A02/MF A01. Order Number DE84002453.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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Examples are given of time-resolved beam profiles measured on ETA using several techniques. One method uses a Faraday cup that is remotely movable in two-transverse dimensions (x, y). In another method a small diameter wire or pellet target is moved across the beam and the bremsstrahlung x-ray intensity is plotted. Data for these methods are recorded using a Tektronix 7912 digitizer at 16 equally spaced times during 50 ns. Three other methods use a time gated (4 ns) microchannel plate television camera to record a two-dimensional image of the beam intensity on a single pulse. The light sources used for imaging are: Cherenkov light from a Kapton foil, prompt visible light from a titanium foil and radiated light from gas molecules excited by the beam. We are also testing an x-ray pinhole camera using K/sub α/ x-rays from tungsten.

3144 **Electron-beam guiding and phase-mix damping by an electrostatically charged wire.** Prono, D.S.; Caporaso, G.J.; Cole, A.G.; Briggs, R.J.; Chong, Y.P.; Clark, J.C.; Hester, R.E.; Lauer, E.J.; Spoerlein, R.L.; Struve, K.W. (University of California, Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review Letters;* **51**: No. 9, 723-726(29 Aug 1983). Contract W-7405-ENG-48.

A new and relatively simple method has been developed to focus and guide electron beams without the use of a magnetic field. The scheme relies on the electrostatic charging of a highly resistive wire in the presence of a beam. The beam is then strongly guided and focused by the oppositely charged wire. In addition, the highly anharmonic nature of the wire potential leads to rapid phase-mix damping of transverse beam displacements and radial pulsations.

3145 **(ANL-Trans—1212) Beam profile monitor systems for the 180 MeV stage of MAMI.** Herminghaus, H. (Argonne National Lab., IL (USA); Mainz Univ. (Germany, F.R.). Inst. fuer Kernphysik). May 1983. Contract W-31-109-ENG-38. Translation of Internal Memorandum No. 8/81. 26p. NTIS, PC A03/MF A01. Order Number DE84002699.

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The monitor system for the 14-MeV stage is limited to the detection of the position of the beam center of gravity. It does not offer a direct check of beam matching. Previous operating experience indicates that this is an important drawback. In stages 2 and 3 of MAMI information about the density distribution over the beam cross section are particularly important due to the especially weak focusing on the last orbits of the 175 MeV stage and due to the danger of beam diffusion in the 800 MeV stage. Imperfect matching becomes noticeable by way of periodic fluctuation of the beam di-

ameter (and the double betatron frequency). For purposes of detection a wire scanner is basically sufficient. For the detection of overcoupling, such as was discovered in the 14 MeV stage after beam emission, a monitor is necessary, however, which provides the two-dimensional density distribution over the beam cross section.

3146 **Experience with a double-compensating beam calorimeter.** Jarmie, N.; Brown, R.E.; Hardekopf, R.A.; Martinez, R. (Los Alamos National Lab, Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1508-1510(Apr 1983). Contract W-7405-ENG-36.

In an experiment to measure the D(t,$\alpha$)n cross section at beam energies of 10 to 120 keV, the authors have developed a double-compensating beam calorimeter, based on a Swiss Design to measure the particle beam intensity. A Faraday cup is not useful because of considerable charge exchange in the target gas at such low beam energies. The authors calibrated the calorimeter both with 10- and 3-MeV protons (comparing with a Faraday-cup measurement of the beam flux) and with the heat generated in a precision resistor. Both methods agree and give a calibration accurate to + or - 0.08% over a range of 10 to 800 mW beam power. Beam powers as low as 5 mW may be used, but with less accuracy. The beam energy must be known in order to calculate the particle intensity. Some difficulties with and peculiarities of the device are discussed.

## 4303 Auxiliaries And Components

*REFER ALSO TO CITATION(S) 2704, 2890, 3131, 3161, 3634, 3689, 3693, 3694, 3813, 3895, 3906, 3964*

3147 **(CONF-8309127—5) Heavy ions, targets, and research at HHIRF.** Ford, J.L.C. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 43p. NTIS, PC A03/MF A01. Order Number DE84000681.

From International Nuclear Target Society workshop; Argonne, IL, USA (7 Sep 1983).

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The Holifield Heavy Ion Research Facility (HHIRF) typifies a new generation of heavy ion accelerators capable of producing high resolution beams with sufficient energy to study nuclear reactions across the periodic table. Exploiting the capabilities of the machine depends on the availability of thin foils at each stage of the experimental process. Rugged carbon foils are needed in the tandem and cyclotron to strip injected ions up to high charge states. Experimental success largely depends on the availability of a suitable target for bombardment which imposes new demands on the target maker. Many experiments use large solid angle gaseous counters with very thin foils as windows. The accelerators, experimental apparatus, and beam characteristics will be described. Target requirements demanded by different types of experiments will be discussed. These requirements have lead to the construction of specialized apparatus such as the supersonic gas jet target and the single crystal goniometer for blocking measurements.

3148 **(DOE/ER/40048—77-L3) Some methods and problems associated with making thick (1 mg/cm$^2$) $^{28}$ $^{29}$ $^{30}$silicon targets.** Hinn, G.M. (Washington Univ., Seattle (USA). Nuclear Physics Lab.). 1983. Contract AC06-81ER40048. 15p. (CONF-8309127—4). NTIS, PC A02/MF A01. Order Number DE84001543.

From International Nuclear Target Society workshop; Argonne, IL, USA (7 Sep 1983).

The unique difficulties of evaporating enriched silicon starting with the oxide are cited and the literature reviewed and discussed briefly. A procedure is reported which has shown some degree of success.

3149 **(JAERI-M—82-086) Background analysis on a detector shield system for fast neutron scattering experiments.** Takahashi, Hideaki; Sugiyama, Kazusuke; Yamanouti, Yoshimaro; Tanaka, Shigeya. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 42p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703750.

A detector shield system for fast neutron scattering experiments to be installed in the JAERI tandem accelerator building has been designed using three-dimensional Monte Carlo calculations. The energy range of incident neutrons taken in the design calculations is up to 40 MeV. It is required to construct the detector shield system which can shield these high energy background neutrons effectively to perform neutron scattering experiments with good S/N ratio. By performing design analysis in detail using contribution flux, the origins and the quantities of various background components to the detectors have been pursued, and the optimum shapes of the shadow bar and the collimator channel in the shield system have been obtained.

3150 **(JINR—9-82-757) Comparison of the ionooptical parameters of one- and two-stage accelerator systems.** Ditrikh, Yu.; Kozlovski, Z.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1982. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703753.

One- and two-stage electrostatic accelerator systems including plasma emitter are theoretically studied and compared. In the two-stage accelerator system (extraction-acceleration-decelerations) lowest values of beam divergence, weak influence of aspect ratio, lowest influence to variation in plasma density and largest current density of the emitter with low beam divergence are obtained in comparison with other studied extraction systems.

3151 (LA—9798-P, pp 2-5) **Overview.** Silbar, R.R. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The report presents a preliminary version of the physics justification for upgrading the present LAMPF accelerator to a new and unique facility, LAMPF II. The body of this report summarizes the most compelling future directions for research at a machine such as LAMPF II. We have adapted material from a series of recent workshops that defined the fields of interest. Four main areas of physics are covered: (1) nuclear systems; (2) strong interactions: few-hadron systems; (3) electroweak interactions and beyond; and (4) interdisciplinary studies. (WHK)

3152 (LA—9798-P, pp 51-53) **Pion spectroscopy at LAMPF II: possibilities for EPICS II.** Bhatia, T.S. (Los Alamos National Lab., NM); Morris, C.L.; Thiessen, H.A.; Dehnhard, D.K. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A possibility for a new pion spectrometer, EPICS II, with much better resolution than the present EPICS is examined. Such a new spectrometer coupled with higher energy and increased flux of pions at LAMPF II would permit spectroscopic studies that are not presently feasible. Extension of spectroscopic studies to heavier targets and double charge exchange to excited states will become possible.

3153 (LA—9798-P, pp 237-242) **Possible neutrino beams, fluxes, and rates at LAMPF II.** Wang, K.C.; Allen, R.C.; Chen, H.H. (Univ. of California, Irvine). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Neutrino fluxes at LAMPF II with several different beam arrangements were calculated using numerical integration. Dependence of the flux on several parameters of the prospective neutrino facility was examined. Estimated event rates for nu/sub mu e/ and nu/sub e/e elastic scattering are also given.

3154 (LA—9798-P, pp 249-252) **Neutrino beams at LAMPF II.** Abolins, M.; Brock, R. (Michigan State Univ., East Lansing). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The LAMPF II rates for various neutrino-induced reactions are discussed for a 16-GeV and a 32-GeV primary proton beam. Neutrino production spectra are estimated by scaling Fermilab spectra to LAMPF II energies.

3155 (LA—9798-P, pp 408-409) **Radioisotope production.** Bradbury, J.N. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Radioisotope production at LAMPF is reviewed, and plans for a new radioisotope production facility at LAMPF II are briefly described. (WHK)

3156 (LA—9798-P, pp 409) **High-level radiation environment studies.** Bradbury, J.N. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A new dedicated facility for performing proton and neutron irradiations will be constructed that will operate simultaneously with the radioisotope production facility in parallel with LAMPF II using a large fraction of the LAMPF injector current. This facility will provide vertical penetrations into the beam, large target volumes, temperature control capability, and improved shielding to reduce leakage of activated gas.

3157 (SAND—83-0110) **Bremsstrahlung converter debris shields: test and analysis.** Reedy, E.D. Jr.; Perry, F.C. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1983. Contract AC04-76DP00789. 103p. NTIS, PC A06/MF A01. Order Number DE84002147.

Electron beam accelerators are commonly used to create bremsstrahlung x-rays for effects testing. Typically, the incident electron beam strikes a sandwich of three materials: (1) a conversion foil, (2) an electron scavenger, and (3) a debris shield. Several laboratories, including Sandia National Laboratories, are developing bremsstrahlung x-ray sources with much larger test areas (~ 200 to 500 $cm^2$) than ever used before. Accordingly, the debris shield will be much larger than before and subject to loads which could cause shield failure. To prepare for this eventuality, a series of tests were run on the Naval Surface Weapons Center's Casino electron beam accelerator (~ 1 MeV electrons, 100 ns FWHM pulse, 45 kJ beam energy). The primary goal of these tests was to measure the stress pulse which loads a debris shield. These measurements were made with carbon gages mounted on the back of the converter sandwich. At an electron beam fluence of about 1 $kJ/cm^2$, the measured peak compressive stress was typically in the 1 to 2 kbar range. Measured peak compressive stress scaled in a roughly linear manner with fluence level as the fluence level was increased to 10 $kJ/cm^2$. The duration of the compressive pulse was on the order of microseconds. In addition to the stress wave measurements, a limited number of tests were made to investigate the type of damage generated in several potential shield materials.

3158 (UCRL—89214) **Status of the Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory free electron laser (FEL).** Orzechowski, T.J.; Moebus, M.C.; Penko, F.A.; Prosnitz, D.; Rogers, D.; Chavis, C.S.; Halbach, K.; Hopkins, D.B .; Kuenning, R.W.; Paul, A.C. (Lawrence Livermore National Lab., CA (USA); Lawrence Berkeley Lab., CA (USA)). 19 Sep 1983. Contract W-7405-ENG-48. 13p. (CONF-8306121—4). NTIS, PC A02/MF A01. Order Number DE84002455.

From 4. workshop on free-electron laser devices; Eastsound, WA, USA (27 Jun 1983).

A description of the FEL experiment underway at the 10 kA, 5 MeV Experimental Test Accelerator (ETA) is described. The facility has been designed to investigate the high-gain operation of an FEL.

3159 **High-intensity lithium-ion source.** Weber, P.G. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Review of Scientific Instruments;* **54**: No. 11, 1506-1508(Nov 1983).

This high-intensity lithium-ion source is a modified duopigatron. The arc discharge between the cathode and anode in a working gas, typically helium or hydrogen, expands through an aperture in the anode into an expansion cup containing lithium vapor, which is subsequently ionized. Results of spectroscopy and mass analysis are reported. Total continuous output at low accelerating potentials has exceeded 15 $mA/cm^2$ while operating at 10% of the maximum arc current capability.

3160 **Evolution of SLAC and its program.** Panofsky, W.K.H. (Stanford Linear Acclerator Center). *Physics Today;* **36**: No. 10, 34-47(Oct 1983).

In the two decases since construction began, the Stanford Linear Accelerator Center and its electron accelerator, two miles long, have made many fundamental contributions to particle physics.

3161 **Comparison between solid graphite and graphite cloth as a target backing material for an ISOL system.** Schmid, M.; Gill, R.L. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.); Chung, C. (Maryland Univ., College Park (USA). Dept. of Chemistry). *Nuclear Instruments and Methods in Physics Research;* **211**: No. 2/3, 287-291(15 Jun 1983).

A high temperature target-ion source system developed for the TRISTAN on-line isotope separator at Brookhaven National Laboratory is described. The system consists of a surface ionization chamber with a Re surface and $^{235}U$ in a graphic target matrix. Both solid graphite and graphite cloth targets were tested. The overall separation efficiencies for isotopes of Rb, Cs, Sr, Ba, In, Ce, Pr, Nd and Pm which were extracted directly from the ion source were measured. Production rates were measured as a function of temperature up to 2000°C and the ion source performance was monitored over long periods of time. The performance of solid graphite targets was found to give superior stable operation with no deterioration in production rates for operation times of up to 2000 h. In contrast, graphite cloth targets exhibited deterioration in efficiency with time for most elements with differing rates. The production rates of Ce and Pr isotopes increases significantly during the first 400 h of operation, followed by a slow decrease.

3162 **Calculation of the ORELA neutron moderator spectrum and resolution function.** Coceva, C.; Simonini, R. (Nuclear Energy Agency, Bologna (Italy)); Olsen, D.K. (Oak Ridge National Lab., TN (USA)). *Nuclear Instruments and Methods in Physics Research;* **211**: No. 2/3, 459-467(15 Jun 1983).

The yield, spectrum, and delay-time distributions (resolution function) of escape neutrons from the ORELA water-moderated and water-cooled tantalum target assembly are calculated using time-dependent, three-dimensional Monte Carlo techniques. The resulting spectrum and delay-time distributions of the moderated neutrons are compared with measured values.

3163 **Some specialized radiological safety considerations at Argonne National Laboratory's heavy ion research facility.** Cooke, R.H.; Wynveen, R.A. (Occupational Health & Safety Division, Argonne National Laboratory, Argonne, IL). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1588-1591(Apr 1983).

An existing accelerator system at Argonne National Laboratory (ANL) has been upgraded and is being extended to provide heavy ions with energies well above the nuclear binding energies (5-25 MeV/A). The final configuration of the system, called the Argonne Tandem-LINAC Accelerator System (ATLAS), is to become a user-oriented national facility for nuclear physics research. ATLAS will produce some specialized radiological safety considerations unique to this facility in addition to the safety considerations normally addressed at accelerators. The ATLAS Facility shares the Physics Building with six other smaller accelerators, offices, and general purpose laboratories, some of which are used for low-level counting of radioactivity. The portions of ATLAS that currently exist and those portions that are under construction are shown. The FN-Tandem has been operational since the mid 60's. Currently, two ion source injection systems are housed within the Tandem vault. Target Area I has been in use for many years and continues to be used for beams from the Tandem. The booster LINAC exists now and currently delivers beam into target area II. The booster LINAC consists of 24 independently-phased superconducting split-ring resonators housed in four cryostats. Each superconducting split-ring resonator can have up to 1.5 MV potential between the drift tubes. A new beam enclosure, to house an additional 18 resonators in 3 cryostats, and a new target area III are under construction. From the distribution of charge states created by the strippers located before the 40° bend, it is anticipated that beams will be delivered to target areas II and III simultaneously. The

maximum projectile energy for each of the three target areas is shown as a function of projectile mass.

3164 **Preparation and characterization of tritium targets.** Ramey, D.W.; Adair, H.L. (Oak Ridge National Lab, P.O. Box X, Oak Ridge, TN 37830). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1575-1579(Apr 1983).

The Isotope Research Materials Laboratory (IRML) of the Oak Ridge National Laboratory (ORNL) prepares tritium targets that are used to produce an intense beam of 14.5 MeV neutrons by the $^{3}_{1}H(^{2}_{1}H,^{1}_{0}n)^{4}_{2}He$ reaction. The intense beams of 14.5 MeV neutrons are used in programs involving cancer research, materials evaluation, and materials identification. The tritium targets required by researchers have ranged in size from 1-cm diam to 50-cm diam and have contained from 3.7 x $10^{4}$ MBq to 2.2 x $10^{6}$ MBq of tritium. Important parameters in the performance of tritium targets, when bombarded with deuterons, include target lifetime and neutron output. These parameters are heavily dependent on the host metal layer used to form the tritide compound and the gas-to-metal loading of the host material. Fabrication procedures used in preparing titanium tritide targets with subsequent gas-to-metal determinations are described.

3165 **Preparation and characterization of heavy ion targets.** Adair, H.L.; Kobisk, E.H. (Oak Ridge National Lab, P.O. Box X, Oak Ridge, TN 37830). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1555-1562(Apr 1983).

Many of the same target preparation techniques used to fabricate samples to be bombarded with light ions (protons, deuterons, $^{4}He^{++}$, etc.) in various nuclear research studies can be and are used in fabricating targets for heavy ion interaction research. However, the experimental data obtained in heavy ion studies are far more sensitive to variations in target parameters than those resulting from light ion interactions. Careful consideration of anticipated results of the research must be given in selecting preparative techniques that can yield the desired target characteristics. Proper interpretation of experimental results demands that the target used is extensively characterized. Effects of specific target parameters, e.g., thickness, nuclidic uniformity, impurity concentration and identification, are reviewed in this paper. Preparative and characterization techniques are critically examined in terms of their effects on experimental results and on target lifetime.

### 4304 Storage Rings

3166 **(CAPE—2882) SLAC beam scraper (and mask) for MK1 kicker magnet SPEAR 4S5 and 14S15 (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 27 Mar 1974. Contract AC03-76SF00515. TIC, PO Bx 62, Oak Ridge, TN 37831.

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The drawings listed on the Auxiliary Drawing List provide the data and specifications for constructing a beam scraper and mask assembly. This device protects other beam line devices such as beam position monitors from unwanted electrons or positrons and synchrotron radiation. This device is used at Sections 4S5 and 14S15 on the SLAC SPEAR Electron-Positron Storage Ring. The top assembly drawing is not available.

3167 (LA—9798-P, pp 245-248) **Muon storage ring for LAMPF II.** Neuffer, D. (Fermilab, Batavia, IL). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A muon storage ring is suggested as a possible tool in a search for neutrino oscillations at LAMPF II. The same system can also be used for precision neutrino-interaction measurements and for anti p accumulation. Parameters of a sample system are described.

## 44 INSTRUMENTATION

*REFER ALSO TO CITATION(S) 3851, 3852*

### 4401 Radiation Instrumentation

*REFER ALSO TO CITATION(S) 1754, 2195, 2199, 2207, 2332, 2387, 2824, 4096*

3168 **(BNL—33859) MWPC data acquisition in the Brookhaven FASTBUS.** Black, J.K.; Blatt, S.R.; Campbell, M.C.; Kasha, H.; Schmidt, M.P.; Schwarz, C.B.; Morse, W.M.; Benenson, G.; Larsen, R.C.; Leipuner, L.B. (Brookhaven National Lab., Upton, NY (USA); Yale Univ., New Haven, CT (USA)). 1983. Contract AC02-76CH00016. 2p. (CONF-831015—14). NTIS, PC A02/MF A01. Order Number DE84002696.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

For Brookhaven AGS Experiment No. 749, a data acquisition system to accommodate 12, 256 wire multiwire proportional chambers (MWPCs) has been built in the context of the Brookhaven FASTBUS. Information about wires hit or continuous clusters of wires hit is encoded as the centroids of the clusters and number of wires in those clusters. The encoded information is stored in a stack memory in a FASTBUS module where it can be accessed by a FASTBUS Master. Encoding time is less than 4 microseconds. Also, information (in the form of front panel outputs) as to the nature of the data is available in less than 200 nanoseconds.

3169 **(CEA-R—5201) Detection limit of a signal in a background. Application to radioactivity measurements.** (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). 1983. 32p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703744.

Two limiting levels are defined: - the critical level So which is the limit of the observed net Signal above which it can be concluded that a "true" signal is present. - The detection limit msub(D) which is the lowest "true" signal having a probability P to be detected. Equations are presented for calculating So and msub(D) and derive from the observed signal with its associated random fluctuations. A few examples of application are given in the case of radioactivity measurements.

3170 **(CONF-820931—13) Collective aspects of charged particle track structure in non-metallic solids.** Ritchie, R.H. (Oak Ridge National Lab., TN (USA)). 1982. 9p. NTIS, PC A02/MF A01. Order Number DE84001945.

From 8. symposium on microdosimetry; Juelich, F.R. Germany (27 Sep 1982).

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There is no generally accepted mechanism to explain atomic displacement in, and sputtering from, non-metallic solids by swift charged particles. An ion with speed v v/sub O/ = $e^{2}$/h-bar = 2.19 x $10^{8}$ cm/s loses most of its energy to electrons in a stopping medium, but it is thought that atomic displacement is necessary for track registration. Only phenomenological analysis has been made of the complex sequence of events following excitation and ionization near a charged particle path that ends finally in displacement. The ion explosion model has been much discussed. it assumes that ejected electrons are trapped far from the track and that the potential energy of the residual ions becomes converted to kinetic energy. We have been led to a quantitative theory of track formation in which escape of electrons to large distances from the core is computed self-consistently. Those electrons that return form a partially compensated ion-electron core plamsa that is fed from excited states existing in high concentration near the core. The evolution of the positive column is described by a hydrodynamical theory. The conversion of ionic and electronic motion to atomic displacement is described by a transport equation in which conventional atom-atom cross sections are employed. Preliminary results indicate that both ion explosion and core plasma effects may be important in some solids.

**3171 (CRN-PN—82-28) Study of the operation of migration chambers for detection with the SPES III spectrometer.** Aslanides, E.; Bergdolt, A.M.; Bergdolt, G.; Bing, O.; Ernwein, R.; Fassnacht, P.; Hibou, F. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1982. 42p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703786.

Several models were employed at the NRC to study the characteristics of CERN and MIT type migration chambers. The performance of CERN and MIT chambers was evaluated using the Saturne beam. The results enabled working conditions to be established for this type of chamber, reading problems to be studied and some special points associated with the final specifications of the SPES III chambers to be defined.

**3172 (DOE/ER/40012—T1) Study of high-energy physics underground. Technical progress report.** Lande, K. (Pennsylvania Univ., Philadelphia (USA). Dept. of Physics). Oct 1983. Contract AC02-81ER40012. 25p. NTIS, PC A02/MF A01. Order Number DE84001881.

The status of the Large Area Liquid Scintillation Detector now under construction in the Homestake Mine is given. The physics goals are discussed including searches for massive magnetic monpoles, atmospheric neutrinos, and neutrino bursts from collapsing stars. The construction status and detector electronics are described. Also, solar neutrino detection with a liquid scintillator stack is discussed. (WHK)

**3173 (FEI—1347) Measuring background by the DIN-1M spectrometer using the oscillating absorbing screen method.** Glazkov, Yu.Yu.; Liforov, V.G.; Novikov, A.G.; Parfenov, V.A.; Semenov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703787.

Technique for measuring background by a double pulse slow neutron spectrometer is described. To measure the background on oscillating absorbing screen (OAS) periodically overlapping primary neutron beam at the input of a mechanical interrupter was used. During the overlapping monochromatic neutrons conditioned the effect are removed out of the beam and general background conditions are not practically applied. Screen oscillation permits to realize the condition of simultaneous measurement of effect and background neutrons. The optimal period of oscillations amounts to approximately 3 min. Analysis of neutron spectra scattered with different materials and corresponding background curves measured by means of the OAS technique shows that the share of monochromatic neutrons passing through the screen constitutes less than 1% of elastic peak and relative decrease of the total background level doesn't exceed 1.5-2%.

**3174 (FRNC-TH—1113) Application of the Monte Carlo method to the study of the response of an organic liquid scintillator irradiated by photons.** Dupre, Corinne. (Toulouse-3 Univ., 31 (France)). Oct 1982. 86p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703323.

The Monte Carlo method was applied to simulate the transport of a photon beam in an organic liquid scintillation detector. The interactions of secondary gamma rays and electrons with the detector and its peripheral materials components such as the pyrex glass container are included. The pulse height spectra and the detectors efficiency are compared with calculated and measured results. Calculations and programmation methods are presented in the same way as results concerning cobalt and cesium sources.

**3175 (IAEA-SR—72, pp 307-326) Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment.** Krzesniak, J.W.; Krajewski, P. (Centralne Lab. Ochrony Radiologicznej, Warsaw (Poland)). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/31).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

The new method of an integral diffusion filter paper (IDFP) utilizes the radioiodine adsorption on a surface of a S and S No.508 filter (chemically) impregnated with 10% TEDA. The adsorption properties of an IDFP were determined in an exposure chamber with $CH_3{}^{131}I$ generator. The following conclusions were arrived at: 1. The minimum detectable true airborne radioiodine concentration was: (i) for the standard method: 0.13 Bq/m³ for $^{131}I$ and 0.08 Bq/m³ for $^{125}I$ when the volume of the sample was 48 m³, (ii) for the IDFP method the corresponding values were 3.13 Bq/m³ and 2.08 Bq/m³ for the 5 cm dia. filter and the exposure time = 24 hrs. 2. The monitoring of airborne radioiodine concentrations can be easily performed both for $^{131}I$ and $^{125}I$ by means of an IDFP. 3. The results of monitoring with an IDFP are comparable with those made with a standard May-pack method. 4. A selective method was developed of $^{125}I$ and $^{131}I$ concentration for determination from a single air sample. 5. The monitoring should be carried out by means of a small IDFP badge worn at a fixed place on a laboratory coat.

**3176 (INDC(GDR)—18/L) Peak separation from time-of-flight spectra and problems of detector efficiency determination in neutron spectroscopy.** Schmidt, D.; Seeliger, D. (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). Sep 1982. 39p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703790.

An analytical expression for real neutron line representation is discussed in detail. In connection with elastic peaks from a small carbon sample this function can give a convenient model line to separate elastic peaks from continuous spectra. This problem is also discussed. Using the 252-Cf method for efficiency determination the experimental points have to be continued to higher energies. Related problems are discussed and illustrated by examples.

**3177 (INIS-BR—79, pp 249) Multiwire proportional chamber for Moessbauer studies of surfaces.** Contar, J.M.R.; Marechal, B.; Silva, S.A. da; Souza Barros, F. de (Rio de Janeiro Univ. (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

**3178 (INIS-BR—80) Properties of an extrapolation chamber for beta radiation dosimetry. Determination of calibration factors.** Caldas, L.V.E. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). [nd]. 9p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704405.

The properties of a commercial extrapolation chamber were studied, and the possibility is shown of its use in beta radiation dosimetry. The chamber calibration factors were determined for several sources ($^{90}Sr$, $^{90}Y$-$^{204}Tl$ and $^{147}Pm$) making known the dependence of its response on the energy of the incident radiation. Extrapolation curves allow to obtain independence on energy for each source. One of such curves, shown for the $^{90}Sr$-$^{90}Y$ source at 50 cm from the detector, is obtained through the variation of the chamber window thickness and the extrapolation to the null distance (determined graphically). Different curves shown also: 1) the dependence of the calibration factor on the average energy of beta radiation; 2) the variation of ionization current with the distance between the chamber and the sources; 3) the effect of the collecting electrode area on the value of calibration factors for the different sources.

**3179 (INIS-mf—8473, pp 290-304) Review of the dynamic response of self-powered flux detectors in CANDU reactors.** Allan, C.J. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Self-powered flux detectors are used extensively in CANDU reactors for flux-mapping, control, and safety. In these applications,

particularly the latter, it is important to take into account the dynamic response of the detectors. The transfer functions of the detectors used in the Bruce A, 600 MW, and Bruce B reactors have been measured, on several occasions. The available data, including data on delayed reactor γ-rays which largely determine the delayed response of platinum and Pt-clad Inconel detectors, is reviewed. The effect of burn-up on the latter detectors is discussed. Methods of optimizing the response are presented.

3180 (INIS-mf—8473, pp 310-315) **Isotope specific noble gas monitoring.** Malm, H.L.; Allen, T. (Aptec Engineering Ltd., Downsview, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

An instrument is described that identifies the isotopes of the radioactive noble gases emitted by a nuclear power plant and provides much greater sensitivity than previously available equipment. This isotope-specific monitoring system is based on a high-purity germanium gamma spectrometer, a sample chamber, and a data analysis package. Tests carried out at two operating CANDU stations with the system showed that signal-to-background ratios were improved by a factor of 200 to 400 compared to Geiger tube systems. Isotopes identified included $^{41}Ar$, $^{85}Kr$, $^{87}Kr$, $^{88}Kr$, $^{131}Xe$, $^{133}Xe$, and $^{135}Xe$. The mix of noble gas isotopes varied dramatically, sometimes over periods of less than one hour.

3181 (INIS-mf—8473, pp 328-334) **Development of a method to correct for coincidence losses in high count rate gamma-ray spectrometry.** Desilva, K.N.; Chatt, A. (Dalhousie Univ., Halifax, Nova Scotia (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A correction method for coincidence losses due to both analyser dead-time and pulse pile-up in gamma-ray spectrometry has been developed. The method involves the simultaneous measurement of the fractional dead-time, DT, of the analogue-to-digital converter (ADC), and the logic pulse rate, Rsub(s), at the 'SCA OUT' (single channel analyser output) of the ADC as time dependent quantities, using a multichannel scaler. This correction method has been successfully applied to rapidly varying count rates (with initial dead-time over 50%) of nuclides with half-lives as short as a fraction of a second.

3182 **(JAERI-M—82-091) APPLE-2: an improved version of APPLE code for plotting neutron and gamma ray spectra and reaction rates.** Kawasaki, Hiromitsu; Seki, Yasushi. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 71p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703822.

A computer code APPLE-2 which plots the spatial distribution of energy spectra of multi-group neutron and/or gamma ray fluxes, and reaction rates has been developed. This code is an improved version of the previously developed APPLE code and has the following features: (1) It plots energy spectra of neutron and/or gamma ray fluxes calculated by ANISN, DOT and MORSE. (2) It calculates and plots the spatial distribution of neutron and gamma ray fluxes and various types of reaction rates such as nuclear heating rates, operational dose rates, displacement damage rates. (3) Input data specification is greatly simplified by the use of standard, response libraries and by close coupling with radiation transport calculation codes. (4) Plotting outputs are given in camera ready form.

3183 **(JINR—13-82-728) Stabilized high voltage power supply of proportional and drift chambers.** Strmen, P.; Feshchenko, A.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703791.

A high voltage power supply with a good stability has been constructed for the proportional and drift chambers used at the "Hyperon" spectrometer. The power supply is made in CAMAC standard with the use of analog and digital integrated circuits. The high voltage can be regulated form 0 up to 6 kV, maximum current is 0.5 mA. Current limit can be adjusted. The voltage is set either from the front panel or from the computer via and digital-to-analog converter.

3184 **(JINR—13-82-743) Neutron detection channel with a counter based on the SNM-14 corona counter.** Budyashov, Yu.G.; Shishkin, A.L. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety). 1982. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703792.

The block diagram is presented and performance characteristics of the neutron detection channel with a counter based on the SNM-14 corona counter are described. The channel sensitivity to neutrons of Pu-Be source is about 0.6 pulsesxcm²/neutron. A new way of testing the stability of performance of all the measurement line is proposed. It is based on using corona noise as a control pulse source. These devices and testing are developed for a dosymetric control system of the JINR high energy proton accelerator ("F" installation).

3185 **(JINR—13-82-762) Multiparticle event selection with neutral strange particle production. The electronic system of the RISK spectrometer.** Krumshtejn, Z.V.; Lyajste, R.; Mikha i, Z.; Tkachev, L.G.; Ton, T.; Khovanskij, N.N.; Khomenko, B.A.; Shelkov, G.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703801.

The electronic system for selection of multiparticle events with neutral strange particles production is described. The system is developed on the base of scintillation hodoscopes for experiments on the RISK spectrometer. To obtain solution the digital method is used. Time the solution takes is 150 ns. Tests of electronic selection of multiparticle events were held on the IHEP synchrotron in the beam of negative particles with intensity of $10^6$ particles.

3186 **(JINR—13-82-768) RASTR special processor design.** Evtukhovich, P.G.; Zyazyulya, F.E.; Korenchenko, S.M.; Mitsel'makher, G.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703793.

RASTR hardwire special processor intended for the discrimination of data from charge particle detector of the ARES spectrometer is described. This version of the processor performs electron track recognition by means of a special set of masks (about 360). 96 steps are needed for full event review. TTL logic is used. Overall time for one event review is 15 μs, discimination factor is about 9.

3187 **(JINR—13-82-769) Design logic and modelling of RASTR special processor for C-detector of ARES spectrometer.** Baranov, V.A.; Evtukhovich, P.G.; Zazyulya, F.E.; Ilenburg, R.; Korenchenko, S.M.; Mitsel'makher, G.V.; Sergeeva, N.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703794.

On-line hardwire special processor logic for resorting track configuration in MWPC experiment is suggested. The processor performs filtering of electron track information for the search of $\mu^+ \rightarrow e^+ e^+ e^-$ type decay events in charged particle detector of ARES spectrometer. The procedure of calculation and imitation for RASTR real processor design is briefly described. Track recognition efficiency is 96%. Background discrimination factor is about 9.

3188 **(JINR—R-9-82-724) Study of the accuracy of particle track detection by proportional chambers using cathode information readout.** Barabash, L.S.; Baranov, A.M.; Bondarenko, G.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703797.

Results are presented of a study of the accuracy in detecting relativistic particle coordinates in proportional chambers using the cathode information read out. The width of cathode strips was 2 mm and the anode to cathode distance-4 mm. For the tracks perpendicular to the chamber plane the detection accuracy was 50 μm. Two methods of calculation of the centre of the induced charge distribution on the cathode strips are described: by the centre of gravity and by least square fit. Studies are presented of the accuracy in measuring the track coordinates as a function of the charge produced in avalanches. It is shown that for single-particle events the change of the width of the induced charge distribution does not exceed 1.2%.

3189 **(JINR—R-10-82-690) Simple method of energy and emission angle determination of protons registeres in heavy liquid bubble chambers.** Mulas, Eh.; Okhrimenko, L.S.; Slovinskij, B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703795.

The simple planimetrical method (PM) for range L and emission angle THETA determination of protons registered on stereopictures on xenon bubble chambers is proposed. It is shown that the accuracy of this method is approximately the same in average as when measurements of L and THETA are made using the microscope according to the corresponding and in corresponding points method. The PM permits to avoid rough errors in events having complicated configuration of secondary particle tracks and gives a chance to gain time in obtaining results at solving some physical problems.

3190 **(JINR—R-13-82-737) Use of the rise time discriminator for the improvement of the Ge(Li)-detector parameters.** Bogdzel', A.A.; Duka-Zojomi, A.; Kliman, Ya.; Presperin, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703802.

The procedure is described of the discrimination on risetime of signals from the Ge(Li) detector in order to improve the following parameters: energy and time resolutions, symmetry of the photopeak, ratio of photopeak to the Compton background. The new discrimination method without time-amplitude convertion is developed. The experimental results obtained with the detectors of different volumes are reported. The method proved to be good for thra spect measurement on the neutron beam.

3191 **(JINR—R-13-82-812) Multiwire proportional low-pressure chamber with a high gas gain coefficient.** Abdushukurov, D.A.; Zanevskij, Yu.V.; Movchan, S.A.; Netushil, T.; Peshekhonov, V.D.; Smykov, L.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703796.

Characteristics of a multiwire proportional low-pressure chamber are presented. Isobutane under 1-100 torr pressure is used as a working gas. An additional gap with homogeneous electric field allows one to increase a gas amplification of the detector by two orders. It is shown that the space resolution of the detector is 0-0.2 mm at a time resolution better than 3 ns.

3192 **(Juel—1837) Neutron spectra unfolding from measured detector activations.** Weise, L. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentralabteilung Brennelement- und Bestrahlungstechnologie). Mar 1983. 137p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751360.

Our knowledge of the neutron spectrum in irradiation facilities essentially rests on the calculation and on the unfolding resp. adjustment based on measured activations, more generally said reactions rates, since the other direct or indirect experimental methods here frequently are not applicable on account of technical reasons. In this situation the neutronic calculation by no means renders superfluous the unfolding because the measurements can confirm or possibly correct resp. improve the calculational results. The FORTRAN code SAND-MX2 is a contribution of the KFA to the international repertoire of unfolding codes. With regard to its contents it is one of the newer versions of the original code SAND-II which are presently used as SAND-II also in the laboratories of several countries as especially practice related unfolding calculational methods. This report may serve as an instruction manual for the routinely neutron spectrum unfolding by means of the code SAND-MX2. It appeared to us not to be superfluous in addition to the above mentioned aim also to give a general view of the present situation in unfolding technique and to touch shortly the other advanced methods because we believed thereby also to give a better understanding of the characteristic features of our programme. In some laboratories several of the here described calculational programmes are alternatively in current use for the purpose of giving a greater confidence to the result of the neutron spectrum unfolding in question.

3193 (LA—9798-P, pp 261-265) **Liquid time projection chamber.** Mahler, H.J.; Doe, P.J.; Chen, H.H. (Univ. of California, Irvine). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The possibility of building a large liquid time projection chamber is discussed. The advantages include a completely active detector, dE/dx information, good energy and spatial resolution, and a large volume. Applications at such a detector are briefly discussed.

3194 **(LA-UR—83-3012) Resonance ionization mass spectrometry at Los Alamos National Laboratory.** Nogar, N.S.; Downey, S.W.; Keller, R.A.; Miller, C.M. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-831025—21). NTIS, PC A02/MF A01. Order Number DE84001705.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

We present recent results on the application of resonance ionization mass spectrometry to the precision measurement of isotope ratios, particularly in the presence of isobaric interferences. Emphasis is placed on hardware developments having the potential to increase ionization efficiency.

3195 **(OEFZS—4203) Radioisotope applications in industry. Part 2: Practical applications.** Frevert, E. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. 102p. (In German). (IA—114/83). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703745.

The practical applications of the isotope technique are reported and illustrated by examples of works of the Department of Isotope Application of the Austrian Research Centre Seibersdorf. First the field of process controling device and control is described, including thickness, density and moisture gauging, the estimation of coatings and material compounds, the location of material defects and the level control. After this a detailed description of all kinds of tracer investigations is given like measurements of flow rate, intermixture, distribution and volume, investigations of corrosion, wear and lubrication and locations of all kind. A short description of gas ionisation, sources of light and isotope batteries is mentioned. Finally a general view of the applications in the fields of chemistry, biology, agriculture and medicine and the most important of the Austrian law of protective screen and its enactment are given.

3196 **(OEFZS—4206) Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer.** Sonneck, G. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. 22p. (In German). (RS—215/83). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703747.

Following a discussion of the density distributions of two-phase mixtures in pipes the influence of the orientation of a three-beam gamma densitometer on the interpretation of data and the computation of the density is analysed. Several methods for calculating profiles and average densities are discussed. The application of these reflections on LOFT led to a change in the orientation of the densitometers in the broken loop.

3197 **(RL—82-080) Report on the potential application of the artificial delay line technique as an ultra high precision electronic readout system for channel plate X-ray imaging detectors.** Bateman, J.E.; Connolly, J.F.; Stephenson, R. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Sep 1982. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703798.

Electronic tests show that, if the input pulse height is digitised and the systematic errors corrected off-line, then a delay line readout system coupled to a suitable channel plate amplifier could yield a digital X-ray imaging system capable of resolving 10000 elements across the image width.

3198 **(SLAC-PUB—3235) Test of lead glass shower counters.** Kawabata, S.; Ogawa, K.; Sugahara, R.; Sumiyoshi, T.; Takahashi, K.; Awaji, N.; Hayashii, H.; Iwata, S.; Gearhart, R.A.; Miyamoto, A. (Stanford Linear Accelerator Center, CA (USA); National Lab. for High Energy Physics, Oho, Ibaraki (Japan); Nagoya Univ. (Japan)). Oct 1983. Contract AC03-76SF00515. 4p. (CONF-831015—15). NTIS, PC A02/MF A01. Order Number DE84002759.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

Lead glass counters made of wedge shaped blocks of SF6 were tested with positrons at SLAC. The beam energy ranged from 2 to 17.5 GeV. Energy dependence and beam position dependence of pulse height and energy resolution were studied with lead glass blocks of various lengths. The effect of a BK-7 light guide on pulse height was clearly observed. Degradation of the energy resolution due to aluminum absorbers of various lengths was investigated. A mesh type photomultiplier was also tested.

3199 **(SLAC-PUB—3236) Status of the IEEE P896 Future Backplane Bus.** Gustavson, D.B. (Stanford Linear Accelerator Center, CA (USA)). Oct 1983. Contract AC03-76SF00515. 4p. (CONF-831015—17). NTIS, PC A02/MF A01. Order Number DE84002760.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

The IEEE P896 Future Backplane Bus project has been influenced by and has influenced FASTBUS and several other contemporary bus designs. This paper summarizes the current status of that project, which is directed toward the needs of modern 32-bit microprocessor systems with multiple processors. Some of the technology developed for P896 will be important for future non-ECL implementations of FASTBUS and other buses. In particular, new bus drivers and receivers should greatly improve the performance and reliability of backplane buses and cable buses. The current status of the P896 serial bus is also summarized.

3200 **(SLAC-PUB—3237) Linearity and resolution of photodiodes.** van Driel, M.A.; Sens, J.C. (Stanford Linear Accelerator Center, CA (USA)). Oct 1983. Contract AC03-76SF00515. 5p. (CONF-831015—16). NTIS, PC A02/MF A01. Order Number DE84002761.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

Measurements are reported of the resolution and linearity of Hamamatsu S1337 Photodiodes mounted on a NaI crystal and exposed to electron energy deposits of up to 80 GeV. The results indicate that these diodes can replace photomultipliers in high-light-yield detectors such as NaI and BGO, when operated in multi-element, compact assemblies in the presence of a magnetic field.

3201 **(UCRL—89632) Use of wrist albedo neutron dosimeters.** Hankins, D.E. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 16p. (CONF-8308140—1). NTIS, PC A02/MF A01. Order Number DE84002467.

From 10. international DOE neutron dosimetry workshop; Acapulco, Mexico (30 Aug 1983).

We are developing a wrist dosimeter that can be used to measure the exposure at the wrist to x-rays, gamma rays, beta-particles, thermal neutrons and fast neutrons. It consists of a modified Hankins Type albedo neutron dosimeter and also contains three pieces of CR-39 plastic. ABS plastic in the form of an elongated hemisphere provides the beta and low energy x-ray shielding necessary to meet the requirement of depth dose measurements at 1 cm. The dosimeter has a beta window located in the side of the hemisphere oriented towards an object being held in the hands. A TLD 600 is positioned under the 1 cm thick ABS plastic and is used to measure the thermal neutron dose. At present we are using Velcro straps to hold the dosimeter on the inside of the wrist. 9 figures.

3202 **Versatile sample chamber for neutron scattering work at high and low temperatures.** Zabel, H. (Department of Physics and Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *Review of Scientific Instruments;* **54**: No. 10, 1413-1414(Oct 1983). Contract AC02-76ER01198.

A simple sample chamber for neutron scattering work is described which can be used in the temperature range from liquid He to 740 K. The design is based on a stainless-steel conical press fit utilizing the aluminum edge of the sample can as a gasket.

3203 **Instrument to detect vapor nucleation of superheated drops.** Apfel, R.E.; Roy, S.C. (Yale University, P.O. Box 2159, New Haven, Connecticut 06520). *Review of Scientific Instruments;* **54**: No. 10, 1397-1400(Oct 1983). Contract AC02-81EV10673.

An instrument to detect the vaporization of superheated drops is described. Using this instrument, quantitative tests have been performed of the response of the superheated drop neutron detector [Nucl. Instrum. Methods 162, 603 (1979)], a tool for possible use in neutron dosimetry, area monitoring, and nuclear spectroscopy.

3204 **Calibration of a decay-product collection and counting apparatus for the determination of exhaled thoron.** Keane, A.T.; Brewster, D.R. (Argonne National Lab., IL). *Health Physics;* **45**: No. 3, 801-805(Sep 1983).

The apparatus described by Aub for the determination of exhaled thoron by electrostatic collection and measurement of its decay products was later modified to obtain improved efficiency in the determination of thoron in the expired air of radium workers. A similar apparatus is in use at the Center for Human Radiobiology to determine thoron in the expired air of former thorium workers. This note describes the method of measurement and the calibration of the apparatus.

3205 **Bismuth germanate as a high-energy gamma-ray detector.** Wender, S.A. (Los Alamos National Lab, Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1539-1542(Apr 1983).

For the past several years the majority of experiments that detected gamma-rays above 10.0 MeV involved large volume NaI detectors with anticoincidence shields surrounding them. These shields serve two purposes: first, they veto cosmic ray events, and second, they reject gamma-ray events that do not deposit their total energy in the crystal. Recently bismuth germanate ($Bi_4Ge_3O_{12}$), or BGO, scintillators have been developed with many properties that may make them an attractive alternative to NaI in many applications. In this particular experiment the authors detect gamma rays following high-energy neutron capture using a white neutron source. The requirements of detector system are that it have good energy and time resolution, high efficiency, and low sensitivity to neutron backgrounds. Since the authors require an array of detectors to simultaneously measure the angular distribution of the radiation along with the excitation function, NaI detectors with anti-coincidence shields seem impractical. They therefore decided to construct a detector system consisting of five 7.6-cm-long by 7.6-cm-diam-BGO scintillators spanning an angular range from 140 to 45 degrees in the reaction plane. A table lists some of the properties of BGO[4] and the values for NaI for comparison. For present application the advantages of BGO are its high average atomic number and its large density. Both these factors contribute towards improving the detector efficiency. The disadvantages of BGO are its lower light output (1/10 of NaI), its high index of refraction (n = 2.15), and its longer wavelength at maximum light output. In addition large BGO crystals often contain trapped bubbles, which scatter

the light. All these factors tend to limit the resolution of the scintillator.

3206 **Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method.** Vieira, W.J. Sao Paulo, Brazil; Instituto de Pesquises Energetices e Nucleares (1982). 131p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

With the aim of studying and applying the Monte Carlo method, a computer code was developed to calculate the pulse height spectra and detector efficiencies for gamma rays incident on NaI (Tl) crystals. The basic detector processes in NaI (Tl) detectors are given together with an outline of Monte Carlo methods and a general review of relevant published works. A detailed description of the application of Monte Carlo methods to gamma detection in NaI (Tl) detectors is given. Comparisons are made with published, calculated and experimental, data.

## 4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

3207 **(CEA-CONF—6624) Radiation effects on the reliabiliaty of microprocessors and associated circuits.** Laviron, A.; Grisollet, J. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Oct 1982. 6p. (In French). (CONF-8209160—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703803.

From 3. symposium on reliability and maintenance; Toulouse, France (18 Sep 1982).

The flexibility of microprocessor systems enables a geographically distributed utilization to be employed in order to simplify the various interconnections. Such systems can be subjected in nuclear installations to generally low dose rate irradiations. This paper describes tests on microprocessors and associated circuits in such environments bringing in mixed neutron and gamma radiations, as well as these radiations separately. The results show that microprocessors and most of the associated circuits can be affected by exposures of gamma radiation between 3000 R and 25,000 R. These limit exposures depend on the rate of exposure.

3208 **(N—8327903) Microcircuit radiation effects databank.** (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Feb 1983. 420p. (NASA-TM—85346). NTIS, PC A18/MF A01.

Radiation test data submitted by many testers is collated to serve as a reference for engineers who are concerned with and have some knowledge of the effects of the natural radiation environment on microcircuits. Total dose damage information and single event upset cross sections, i.e., the probability of a soft error (bit flip) or of a hard error (latchup) are presented.

## 4403 Miscellaneous Instruments

*REFER ALSO TO CITATION(S) 2120, 2121, 2798, 2829, 3450, 4138*

3209 **(DOE/ER/10811—83) Improvement in the design and extension of operating range of viscometers and thermal conductivity cells. Annual technical progress report.** Kestin, J. (Brown Univ., Providence, RI (USA)). Oct 1983. Contract AC02-81ER10811. 7p. NTIS, PC A02/MF A01. Order Number DE84003018.

Purpose is to continue the development of one viscometer (VM3) and the thermal conductivity apparatus (TC1) in order to extend their ranges of operation. Profiting from experience, we propose to adopt a cautious tactic which has served us well in the past. Instead of modifying the instrumentation for operation up to the maximum desired limits, we propose to advance in measured stages. After the attainment of each stage, we pause and perform more or less extensive measurements on substances of industrial and scientific interest.

3210 **(JINR—13-82-713) Two-channel time-to-digital converter.** Grebenyuk, V.M.; Zinov, V.G.; Selikov, A.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703800.

A two-channel time-to-digital converter based on the direct filling of the measured interval by the standard frequency generator pulses with counting them up afterwards is described. Maximum frequency of the code series generator F - 200 MHz (external generator). Number of bits in an output word -12, with the 12th bit being an indication of information. The series frequency differential nonlinearity of the converter F =200 MHz; -+0.5 per cent. The converter is made as a CAMAC module of a unit width. It can operate with the external information storage unit without communication with the crate dataway.

3211 **(LBL—16694) Performance and materials aspects of Ge:Be and Ge:Ga photoconductors for far-infrared detection.** Haegel, N.M. (Lawrence Berkeley Lab., CA (USA)). Sep 1983. Contract AC03-76SF00098. 90p. NTIS, PC A05/MF A01. Order Number DE84003046.

Portions are illegible in microfiche products; Thesis.

Ge:Be and Ge:Ga single crystal material has been developed for use as far infrared photoconductors in low photon background applications. Crystal growth and characterization have been performed in conjunction with measurements of photoconductor performance. Reliable Be doping for Ge:Be detectors has been achieved using Czochralski growth from a carbon susceptor under vacuum. These detectors provide higher responsivity and lower noise equivalent power (NEP) than the Ge:Ga detectors currently used in the 30 to 50 $\mu$m wavelength range. The responsivity of Ge:Be detectors is strongly temperature dependent when the residual shallow acceptors are closely compensated. The breakdown field in low compensation Ge:Ga detectors (K = $10^{-4}$) has been extended from 1.0 to 2.0 V/cm by the introduction of neutral scattering centers. Indiffusion of Cu has been used to limit the mobility and allow the detectors to be operated at higher biases where optimum NEP and responsivity are attained.

3212 **(MINTEK-M—55) New robust method for the treatment of analytical data.** Pearton, D.C.G. (Council for Mineral Technology, Randburg (South Africa)). 6 Nov 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703815.

A new robust method is proposed for the calculation of the median and the relative standard deviation for a set of data containing unsymmetrically placed outliers. Examples of the advantages of the new method are given, the findings being confirmed by Monte Carlo tests. At Mintek mass-spectrometric data are often unsymmetrical, and all outliers are often at one of the extremities, either all high or all low. In some instances the outliers can be seen visually, and would therefore be rejected on sight. However, when large sets of results are processed, such as those from mass-spectrometric, X-ray fluorescence, and neutron-activation analyses, or in fields such as the assignment of values to reference materials, the sets of results are often too large for visual inspection and are processed within the computer.

3213 **(MINTEK-M—61) Atomic-absorption programme for the Apple 2 plus computer.** Wepener, J.H.; Pearton, D.C.G. (Council for Mineral Technology, Randburg (South Africa)). 30 Oct 1982. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703826.

An interactive computer programme, the AA-PROGRAM APPLE, has been designed and written to process data obtained during routine analysis by atomic-absorption spectrophotometry. The programme is fast, convenient for the user, and was found to perform satisfactorily during routine operation in the laboratory. The computer used is an Apple II Plus with a video screen, and the language of the programme is Applesoft BASIC. Operating instructions for the computer and a printout of the programme are given in the Appendices.

3214 **(MINTEK-M—80) Installation and commissioning of a Siemens SRS200 sequential X-ray-fluorescence spectrometer.** Balaes, A.M.E.; Jacobs, J.J. (Council for Mineral Technology, Randburg (South Africa)). 25 Feb 1983. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704297.

The operation of the Siemens SRS200 automatic X-ray spectrometer, which can also be operated manually, is described. Details of its application to routine analysis are given, and these demonstrate its high level of performance, even in the analysis of elements present in part-per-million concentrations. Modifications that were made to the sample cups and the installation of a non-dedicated computer are discussed.

3215 **(SAND—83-2148C) InAsSb strained-layer superlattices for long wavelength detector applications.** Osbourn, G.C. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 13p. (CONF-8310188—1). NTIS, PC A02/MF A01. Order Number DE84001055.

From 5. molecular beam epitaxy workshop; Atlanta, GA, USA (6 Oct 1983).

InAsSb strained-layer superlattices have been proposed as III-V candidates for 8 to 12 μm applications. The wavelength response of certain InAsSb SLSs can be extended beyond 12 μm at 77°K through the intentional use of layer strains, regardless of the conduction band offsets in this system. This material system offers the metallurgical and device processing advantages of III-V semiconductors. The InAsSb SLSs also offer reduced sensitivity to lateral compositional variation and reduced band to band tunneling compared to bulk $Hg_{0.795}Cd_{0.205}Te$.

3216 **High-frequency magnetic measurements using small inductive probes.** Beiersdorfer, P.; Clothiaux, E.J. (Department of Physics, Auburn University, Auburn, Alabama 36849). *American Journal of Physics;* **51**: No. 11, 1031-1036(Nov 1983). Contract AC02-76CH03073.

Experiments with small magnetic probes suitable for advanced undergraduates are described. The experiments are designed to show that an inductive probe does not respond to high-frequency signals (1—70 MHz) as might be expected from experience with probes at low frequencies. Pickup of noninductive signals is demonstrated, resonances are observed, and the inductance, capacitance, resistance, and effective area of the probe are measured. In addition, the conductivity of copper and aluminum is found using thin metal foils.

3217 **Ion cyclotron resonance bridge detector for frequency sweep.** Pitsakis, M.N.; Wobschall, D.C. (Department of Electrical and Computer Engineering, State University of New York at Buffalo, Amherst, New York 14260). *Review of Scientific Instruments;* **54**: No. 11, 1476-1481(Nov 1983).

An electronic ion cyclotron resonance detection system was designed and constructed. The ions are excited by sweeping the frequency of the electric field (3—300 kHz) using a sweep frequency generator with a nonlinear sweep voltage in order to maintain an approximately constant mass resolution. Ion detection is accomplished by a bridge with a phase-sensitive detector as a demodulator. The required reference signal for the phase-sensitive detector is generated by a circuit with a transfer function which approximates that of the ICR signal in order to obtain an accurate phase match between the signal source and the detector. The device is capable of detecting a minimum concentration of 50 ions/cm$^3$ over a mass range of 15 to 1500 amu.

3218 **100-microsecond-resolved EXAFS technique for studying protein dynamics.** Huang, H.W.; Liu, W.H.; Teng, T.Y.; Wang, X.F. (Physics Department, Rice University, Houston, Texas 77251). *Review of Scientific Instruments;* **54**: No. 11, 1488-1491(Nov 1983).

We have built a microcomputer-controlled x-ray absorption spectrometer which is capable of measuring 100-μs-resolved extended x-ray absorption fine structure (EXAFS) of dynamic systems. The spectrometer integrates the x-ray absorption signals over a time interval tau at any time t measured from the time of sample excitation. A series of absorption data of different t is measured for a given x-ray energy. The process is repeated for as many different x-ray energies as required. The lower limit on tau is determined by the concentration of sample and the intensity of synchrotron radiation. The system was recently tested at Stanford Synchrotron Radiation Laboratory using a carboxymyoglobin sample. We present the raw data here to demonstrate the feasibility of this spectrometer.

3219 **Digitally controlled measurement of sonic elastic moduli and internal friction by phase analysis.** O'Brien, M.H.; Hunter, O. Jr.; Rasmussen, M.D.; Skank, H.D. (Department of Materials Science and Engineering Research Institute, Iowa State University, Ames, Iowa 50010). *Review of Scientific Instruments;* **54**: No. 11, 1565-1568(Nov 1983).

An automated system is described for measuring internal friction and elastic moduli using sonic resonance techniques. This mirocomputer-controlled device does phase angle analysis in addition to traditional decay and peak-width internal friction measurement. The apparatus may be programmed to make measurements at any sequence of temperatures between room temperature and 1600 °C.

3220 **Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures.** Davis, H.A. (Thermophysics Division, National Bureau of Standards, Washington, DC 20234). *Review of Scientific Instruments;* **54**: No. 10, 1412-1413(Oct 1983).

The construction of low-cost optical cells using thin-walled sapphire tubing, which are used for observation of phase separation in fluid mixtures, is described. The three different designs shown have been successfully used in our laboratory.

3221 **Multipulse sequences in electron-spin echoes.** Eliav, U.; Freed, J.H. (Baker Laboratory of Chemistry, Cornell University, Ithaca, New York 14853). *Review of Scientific Instruments;* **54**: No. 10, 1416-1417(Oct 1983). Contract AC02-78ER04991.

A method is described whereby Carr—Purcell (CP) multipulse sequences may be generated at a rate rapid enough for electron-spin echoes ESE and in a manner consistent with constraints of typical ESE spectrometers. Both Carr—Purcell—Meiboom—Gill and alternating phase-CP sequences may be produced. It is shown how such sequences may be utilized (1) to increase the rate of data collection, which is especially important in laser photo-induced experiments, and (2) to study slow motions. They are respectively illustrated with results on transient spin-polarized photoelectrons and electrons trapped in irradiated quartz.

3222 **Optically recording interferometer for velocity measurements with subnanosecond resolution.** Bloomquist, D.D.; Sheffield, S.A. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **54**: No. 4, 1717-1722(Apr 1983). Contract AC04-76DP00789.

An optically recording velocity interferometer system, called ORVIS, has been developed to measure particle velocity histories in shock wave experiments on condensed matter. The interferometer fringe motion is recorded with a high speed electronic streak camera, rather than with photomultiplier tubes and oscilloscopes as in previous interferometry systems. With this approach, the particle velocity of a witness foil in a detonation wave experiment was measured with 300-ps time resolution. We believe that 20-ps time resolution can be achieved with this technique which would represent an improvement of two orders of magnitude over previous measurement techniques.

3223 **Calorimeter for measuring ac magnetic losses in small samples.** Canright, G.S.; Anderson, R.L. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Journal of Applied Physics;* **53**: No. 11, 8269-8271(1 Nov 1982).

A calorimeter has been developed to measure the total core loss in small samples of magnetic materials which are not suited to conventional measurement techniques. The method is similar to the helium boil-off calorimeter used in some cases to measure ac losses in superconductors. Power losses in the sample are determined by measuring the rate of boiling of a fluid in which the sample is im-

mersed. The sample is in open magnetic circuit. Uncertainty of the method is estimated at 3%.

3224 **Applications of microdiffraction with a STEM instrument.** Cowley, J.M.; Watari, F. (Arizona State Univ., Tempe). *Scanning Electron Microscopy;* **3**: 176-177(1980). Contract AC02-76ER02995.

The addition of an optical analysis system, including an image intensifier and low light-level TV camera, to a scanning transmission electron microscopy (STEM) instrument has permitted the observation and recording of microdiffraction patterns from very small regions with high efficiency.

3225 **The role of environmental conditions in in-situ experiments in the high-voltage electron microscope.** Thomas, G.; Westmacott, K.H. (Lawrence Berkeley Lab., CA). *Physica Status Solidi [Sectio] A: Applied Research;* **55**: 563-568(1979). Contract W-7405-ENG-48.

Thin foil specimens may undergo changes in microstructure during examination in a high-voltage electron microscope as a result of specimen interaction with the electron beam and/or its surrounding gaseous environment. When these effects are recognized, and in-situ experiments are performed under well-controlled conditions, useful information can be derived from the observed changes in structure. This is illustrated with three examples; electron beam-induced surface oxidation of Fe-Al alloys, the detection of oxidation-induced surface stresses by dislocation network formation, and the investigations of the structure of glassy phase ceramics through electron beam-induced ionization effects.

3226 **Edge and line enhancement by adaptive lattice filtering.** Brolley, J.E. (Los Alamos Scientific Lab., NM). *Society of Petroleum Engineers Journal;* **186**: 232-237(1979). Contract W-7405-ENG-36.

Digitized images have been two-dimensionally transformed to the Haar sequency domain. High-sequency boosting was performed and the inverse Haar two-dimensional transform applied. The resulting image was then raster-scanned with a continuously adaptive lattice filter. This procedure was applied to a simple image of a photographic step tablet and a complex scene. All of the lines of the step tablet were well defined over the whole dynamic range. Useful definition of lines in the complex scene was obtained.

3227 **Vacuum predisperser for a large plane-grating spectrograph.** Engleman, R. Jr.; Palmer, B.A.; Steinhaus, D.W. (Los Alamos Scientific Lab., NM). pp 24-29 of Proceedings of the society of photo-optical instrumentation engineers. Bellingham, WA; Society of Photo-Optical Instrumentation Engineers (1979). (CONF-790529—).

From Conference on Optics; Los Alamos, NM, USA (23 May 1979).

A plane grating predisperser has been constructed which acts as an "order-sorter" for a large plane-grating spectrograph. This combination can photograph relatively wide regions of spectra in a single exposure with no loss of resolution.

### 4404 Well Logging Instrumentation

*REFER ALSO TO CITATION(S) 1908*

## 45 EXPLOSIONS AND EXPLOSIVES

### 4501 Chemical

3228 **(LA—9651-MS) LARC: computer codes for Lagrangian analysis of stress-gauge data to obtain decomposition rates through correlation to thermodynamic variables.** Anderson, A.B.; Wackerle, J. (Los Alamos National Lab., NM (USA)). Jul 1983. Contract W-7405-ENG-36. 118p. NTIS, PC A06/MF A01. Order Number DE84002404.

This report describes a package of five computer codes for analyzing stress-gauge data from shock-wave experiments on reactive materials. The aim of the analysis is to obtain rate laws from experiment. A Lagrangian analysis of the stress records, performed by program LANAL, provides flow histories of particle velocity, density, and energy. Three postprocessing programs, LOOKIT, LOOK1, and LOOK2, are included in the package of codes for producing graphical output of the results of LANAL. Program RATE uses the flow histories in conjunction with an equation of state to calculate reaction-rate histories. RATE can be programmed to examine correlations between the rate histories and thermodynamic variables. Observed correlations can be incorporated into an appropriately parameterized rate law. Program RATE determines the values of these parameters that best reproduce the observed rate histories. The procedure is illustrated with a sample problem.

3229 **(LA-UR—83-2847) Optical diagnostics for condensed-phase shock-compressed molecular systems.** Schmidt, S.C.; Moore, D.S.; Shaner, J.W. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 69p. (CONF-8310148—11). NTIS, PC A04/MF A01. Order Number DE84001172.

From Los Alamos/CEA high explosives and detonation physics conference; Paris, France (3 Oct 1983).

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Experimental techniques capable of obtaining information about the molecular phenomenology in the region through and immediately behind the shockfront during the shock-compression of condensed-phase molecular systems are discussed and compared. Difficulties associated with performing measurements in this region are briefly reviewed. Some concomitant static experiments that can be used to complement the dynamic measurements are suggested. Developments and advances expected in diagnostic techniques during the next few years are summarized.

3230 **(MLM—3103) PETN homolog analysis and large-scale preparation of pure PETN homologs by high-performance liquid chromatography (HPLC).** Barnhart, B.V.; Schumacher, R.J. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 14 Nov 1983. Contract AC04-76DP00053. 9p. NTIS, PC A02/MF A01. Order Number DE84002169.

A reverse-phase, high-performance, liquid chromatography (HPLC) technique was developed for the analysis of PETN and related nitrate esters to replace or supplement the subjective thin-layer chromatography (TLC) method currently in use.

### 4502 Nuclear

*REFER ALSO TO CITATION(S) 3064*

3231 **(AD-A—130291/8) DNAF-1: an analytical fallout prediction model and code. Final report 12 Mar 80-31 Oct 81.** Norment, H.G. (Atmospheric Science Associates, Bedford, MA (USA)). 31 Oct 1981. 130p. NTIS, PC A07/MF A01.

DNAF-1 has been developed to rapidly predict fallout gamma ray activity from surface burst nuclear explosions. It is suitable for use in large-scale damage assessment studies. Explosion energy yield range is .001 to 100,000 KT. Minimum input data requirements of the code are: total and fission yields, speed and direction angle of a single effective wind vector, and a wind shear parameter. Wind data in terms of a vertical profile of wind vectors may be supplied by the user, in which case the code will process the data such as to compute the effective wind vector and shear parameter. The code will automatically compute and print a fallout map in terms of h plus 1 hour exposure rate ordinates for a spatially undistorted array of points on the ground. Alternatively, the user may specify his own map boundaries and grid increments. He also may specify any number of ground points at which the code will compute H pule 1 hour exposure rate and maximum effective biological dose. Both model and code are fully documented, and user instructions for the code are presented. Results of a validation study are presented. Predicted fallout patterns are compared with observed patterns for five test shots that cover a wide range of energy yields. Predictions by the DELFIC and WSEG-10 models also are included. Visual comparisons of contour maps and various statistical comparison methods are used. DNAF-1 predictions are found to be substantially better than those of WSEG-10 and almost as good as DELFIC predictions.

3232 (CONF-8305107—) **Proceedings: 17th Asilomar conference on fire and blast effects of nuclear weapons.** Hickman, R.G.; Meier, C.A. (eds.). (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 280p. NTIS, PC A13/MF A01. Order Number DE83017704.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

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The objective of the 1983 conference was to provide for the technical exchange of ideas relating to the science and technology of the immediate effects of nuclear weapon explosions. Separate abstracts were prepared for 39 of the papers.

3233 (CONF-8305107—, pp 42-47) **Some observations on the effect of turbulence modeling in numerical simulations of multiple-burst flow fields.** Chapyak, E.J. (Los Alamos National Lab., NM). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

We describe some preliminary attempts to calculate the development of a simple class of axisymmetric multiple-burst environments. Our primary interest is in the intermediate time regime, during which the characteristic plume structures stabilize and begin to spread horizontally. Employing a standard two-equation description of turbulent entrainment, we find that the maximum extent of plume penetration into the atmosphere is sensitive to details of the turbulence modeling. Some interesting dynamic features of the plume stabilization process are also observed. These results are discussed together with supporting analysis and used to identify generic differences between single- and multiple-burst environments.

3234 (CONF-8305107—, pp 48-53) **Hydrocode studies of flows generated by large area fires.** Brode, H.L.; Larson, D.A.; Small, R.D. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The global computational approach to the simulation of the meso-scale motions generated by a large area fire is described. Existing hydrocode solutions are reviewed and ongoing calculations discussed. Assumptions applied in many hydrocode solutions are assessed, and modeling requirements based on recent analytical efforts are defined.

3235 (CONF-8305107—, pp 54-59) **Firestorm formation and environment characteristics after a large-yield nuclear burst.** Hassig, P.J.; Rosenblatt, M. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The ignition and propagation of fires after a large-yield HOB detonation represent a potentially important nuclear weapons effect. Urban areas, with many ignition sources, are particularly susceptible to fires and to the rapid spread and possible coalescence of individual fires distributed over a large area. Under some circumstances, a firestorm may develop. Objectives of this study are to numerically simulate: the physical conditions leading to a firestorm, and the velocity and pressure fields inside and outside a representative firestorm.

3236 (CONF-8305107—, pp 60-65) **Criteria for onset of firestorms.** Carrier, G.F.; Fendell, F.E.; Feldman, P.S. (TRW Space and Technology Group, Redondo Beach, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Quantitative criteria are evolved for onset of firestorms, severe stationary (nonpropagating) holocausts arising via merger of fires from multiple simultaneous ignitions in a heavily fuel-laden urban environment. Within an hour, surface-level radial inflow from all directions sustains a large-diameter convective column that eventually reaches altitude of about 10 km (e.g., Hamburg, Dresden, Hiroshima). As the firestorm achieves peak intensity (2 to 3 hours after the ignitions), inflow speeds are inferred to attain 25 to 50 m/s; typically 12 $km^2$ are reduced to ashes, before winds relax to ambient levels in six-to-nine hours. Here the firestorm is interpreted to be a mesocyclone (rotating severe local storm). Even with exceedingly large heat release sustained over a concentrated area, in the presence of a very nearly autoconvectively unstable atmospheric stratification, onset of vigorous swirling on the scale of two hours requires more than concentration of circulation associated with the rotation of the earth; rather, a preexisting, if weak, circulation appears necessary for firestorm cyclogenesis.

3237 (CONF-8305107—, pp 66-70) **Project Flambeau experimental fire measurements.** Palmer, T.Y. (SWETL Inc., Fallbrook, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

This preliminary analysis and model formulation of the Project Flambeau fires taken together with other information, seems to indicate that mass fires and conflagrations are three-dimensional and oscillatory in nature. Large areas fires seem to naturally fall into a strong fire generated vortices. The vortices oscillated with a period of about 50 seconds in these fires.

3238 (CONF-8305107—, pp 71-77) **Analysis of the large urban fire environment.** Small, R.D.; Larson, D.A. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

An analysis describing the high temperature and velocity environment of a large urban area fire is presented. The boundary value problem treats the burning region in detail. A novel prescription of the boundary conditions at the fire periphery allows the burning-region analysis to be uncoupled from analyses of the free-convection column and the far field. The relationship between burning rate, buoyancy, pressure gradients, and the creation of high velocity fire winds is described. Sample results simulate the burning-region environment for the 1943 Hamburg firestorm.

3239 (CONF-8305107—, pp 78-84) **Large urban fire environment: trends and model city predictions.** Larson, D.A.; Small, R.D. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The urban fire environment that would result from a megaton-yield nuclear weapon burst is considered. The dependence of temperatures and velocities on fire size, burning intensity, turbulence, and radiation is explored, and specific calculations for three model urban areas are presented. In all cases, high velocity fire winds are predicted. The model-city results show the influence of building density and urban sprawl on the fire environment. Additional calculations consider large-area fires with the burning intensity reduced in a blast-damaged urban center.

3240 (CONF-8305107—, pp 86-89) **Strategic threat.** Barker, R.B. (Lawrence Livermore National Lab., CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

An assessment is made of the Soviet defense posture from the standpoint of deterrence and first-strike capability. (DLC)

3241 (CONF-8305107—, pp 144-149) **Air gun test facility.** Napadensky, H.; Swider, E.; Waterman, T.; Pape, R. (IIT Research Inst., Chicago, IL). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

This paper describes a facility that is potentially useful in providing data for models to predict the effects of nuclear explosions on cities. IIT Research Institute has a large air gun facility capable of launching heavy items of a wide variety of geometries to velocities ranging from about 80 fps to 1100 fps. The facility and its capabilities are described, and city model problem areas capable of investigation using the air gun are presented.

3242 (CONF-8305107—, pp 152-158) **Heat conduction analog model of urban fire spread.** Reitter, T.A. (Lawrence Livermore National Lab., CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

It has been shown that the heat conduction analog model can produce plausible results for discontinuous fire spread. Given suitable information on fire spread in a constant wind or spread due to firebrands, it may be possible to incorporate these effects. Fire spread across debris fields should be simpler to treat than the discontinuous case. Modeling of fire-induced winds and related mass fire development appear to be beyond the range of the model.

3243 (CONF-8305107—, pp 159-163) **Moving boundaries: a numerical model.** Kang, S.W. (Lawrence Livermore National Lab., CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

A numerical model for time-dependent moving-boundary phenomena is constructed, with a view towards application of the method to calculation of the fire-spread characteristics in urban environments.

3244 (CONF-8305107—, pp 170-175) **Wind-aided flame spread across strewn debris.** Carrier, G.; Fendell, F.; Fleeter, R. (TRW Space and Technology Group, Redondo Beach, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Design of a laboratory experiment, to supprt further development of an already initiated theoretical model of wind-aided flame spread through a fuel matrix of large porosity, is presented. The design goals include delineation of a well-defined fuel matrix, careful control of the combustion environment (air flow and radiation), capacity for varying parameters (including fuel element type, matrix geometries, and introduction of upslope), and provision for attaining steady-state rate of spread (if one exists). If the model, given initial credibility by the laboratory experiment, is corroborated by field-scale data, then the model may be used with more confidence for predicting the movement in time of a fire front (with current position specified), through a partially combustible debris field of known topographical and aerothermochemical properties, under given meteorological conditions.

3245 (CONF-8305107—, pp 176-182) **Modeling urban fire growth.** Waterman, T.E.; Takata, A.N. (IIT Research Inst., Chicago, IL). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The IITRI Urban Fire Spread Model as well as others of similar vintage were constrained by computer size and running costs such that many approximations/generalizations were introduced to reduce program complexity and data storage requirements. Simplifications were introduced both in input data and in fire growth and spread calculations. Modern computational capabilities offer the means to introduce greater detail and to examine its practical significance on urban fire predictions. Selected portions of the model are described as presently configured, and potential modifications are discussed. A single tract model is hypothesized which permits the importance of various model details to be assessed, and, other model applications are identified.

3246 (CONF-8305107—, pp 184-188) **Blast/fire interaction scaling.** Kanury, A.M. (Univ. of Notre Dame, IN). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Hypotheses are formulated of the process of interaction between an airblast and fires supported by liquid fuels and wood cribs. A map of blast weakness versus fire strength is conceived on which the regime of fire extinction by the blast can be delineated from the regime where the fire will sustain the blast. The fire strength is described for liquid fuels primarily by the heat of combustion; and for wood, it is mainly described by the preburn time. The concept is substantiated by the SRI shocktube data.

3247 (CONF-8305107—, pp 189-194) **Flashover modeling for direct course.** Martin, S.; Hughes, P. (Los Alamos Technical Associates, Inc., NM). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The current fire defense doctrine for nuclear attack preparedness is possibly erroneous in the concept that fires started by the thermal pulse of the nuclear fireball are susceptible to airblast extinction. This concept ignores an observation made during the days of atmospheric nuclear testing. This observation may provide the explanation for some of the puzzles - the contradictions of experimental tests vis-a-vis historical fact - that have for years persisted about the incendiary consequences of nuclear explosions in or near urban complexes. Operation DIRECT COURSE offers an opportunity to resolve a part of the quandary. The question to be answered is whether fires of the rapid fire-growth-to-flashover type, as associated with nuclear thermal-pulse scenarios, are as susceptible to extinction as the current doctrime supposes. This paper describes an experiment designed to gain an answer to that question.

3248 (CONF-8305107—, pp 200-202) **Global-scale obscuration by mass fire smoke.** Kreiss, W.T.; Palmer, T.Y. (Physical Dynamics, Inc., La Jolla, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

An attempt is made to arrive at a realistic assessment of the probability of country-wide mass fires and conflagrations during a nuclear war. A breakdown by area of the USA is made. The probability of sufficient smoke to cause a large climatic change is limited, although visibility may be lowered.

3249 (CONF-8305107—, pp 203-210) **Fire in targeting urban/industrial areas.** Brode, H.L.; Small, R.D. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

A preliminary study of the parameters pertinent to considerations of fire in urban targeting illustrated the dominance of some factors and the insensitivity to damage assessments of others. The factors considered, together with the simple assumptions and approximations used in this scoping study supported the assumption that fire may add significantly to the damage to urban/industrial targets. The influence of uncertainties and unknowns were evaluated, and the consequent implications for research were assessed.

3250 (CONF-8305107—, pp 211-216) **Thermal radiation from a nuclear weapon burst.** Small, R.D.; Brode, H.L. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The different methods and correlations used to calculate the propagation of thermal radiation are reviewed and compared. A simple method to account for radiation enhancement by reflection from a superior cloud deck or snow cover, as well as attenuation of radiation by cloud cover below the burst is presented. The results show that the thermal reach may vary considerably. Additional calculation show that a significant fraction of the thermal energy may be incident after the arrival of the shock wave. Results for a range of weapon yields are presented, and the implications for blast-induced (secondary) fire starts are discussed.

3251 (CONF-8305107—, pp 217-222) **Blast/fire interaction experiments.** McKee, R.G. Jr. (Los Alamos Technical Associates, Inc., NM). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Three categories of experiments at the DIRECT COURSE H.E. Event consist of: (1) constrained debris, (2) unconstrained debris, and (3) room fires. Goal is to reduce the present uncertainties in estimates of fire effects of nuclear explosions caused by airblast effects, notably extinction of fires by airblast.

3252 (CONF-8305107—, pp 224-229) **DIRECT COURSE industrial hardening experiment and predictions.** Willoughby, A.B.; Zaccor, J.V. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The report describes the background for a practical approach to prepare industry (equipment) to survive a nuclear attack. The status of efforts to assess technical options so far conceived at a forthcoming simulation of 1 kt weapon are discussed and results predicted.

3253 (CONF-8305107—, pp 230-236) **Analytic approximations to dynamic pressure and impulse and other fits for nuclear blasts.** Brode, H.L. (Pacific-Sierra Research Corp., Los Angeles, CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Recent fits to data and calculational results provide simple analytic approximations to the overpressure and dynamic pressure from nuclear explosions. The analytic forms provide fits as a function of ground range and height-of-burst for time of arrival, peak overpressure, peak dynamic pressure, onset of Mach reflection, duration of positive phase for both dynamic and overpressure, time histories for overpressure and dynamic pressure, dynamic pressure impulse and overpressure impulse (in the positive phase), and other blast parameters.

3254 (CONF-8305107—, pp 237-242) **Blast loading computations over complex structures.** Mark, A. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD); Kutler, P. 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Computational results of shock waves impinging on a truck-like target and the ensuing diffraction flowfield are presented. The Euler equations are solved with MacCormack's explicit finite difference scheme. Computed pressures on the surface of the model compare favorably with experimental results from shock tube experiments. Isopycnics for the diffraction phase are also presented and show the time-dependent development of vortices generated at the various corners of the model.

3255 (CONF-8305107—, pp 243-248) **Design of blast simulators for nuclear testing.** Mark, A.; Opalka, K.O.; Kitchens, C.W. Jr. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

A quasi-one-dimensional computational technique is used to model the flow of a large, complicated shock tube. The shock tube, or Large Blast Simulator, is used to simulate conventional or nuclear explosions by shaping the pressure history. Results from computations show favorable agreement when compared with data taken in the facility at Gramat, France. Such future shock tubes will include a thermal irradiation capability to better simulate a nuclear event. The computations point to the need for venting of the combustion products since the pressure history will be considerably altered as the shock propagates through these hot gases.

3256 (CONF-8305107—, pp 249-252) **Preliminary nuclear terrorist effects study.** Donich, T.R. (Lawrence Livermore National Lab., CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

The nuclear device is assumed to be a small-yield (less than a few tens of kilotons) fission device. A location of such a device in a city street is assumed, and the probable behavior of the blast wave, thermal radiation, and fallout is discussed. (DLC)

3257 **(LA—9748-MS) Los Alamos laser simulation of high-altitude nuclear-explosion effects. Final report.** Tan, T.H.; Williams, A.H.; Borovsky, J.E.; Pongratz, M.B. (Los Alamos National Lab., NM (USA)). Sep 1983. Contract W-7405-ENG-36. 64p. NTIS, PC A04/MF A01. Order Number DE84002402.

The early time effects of high-altitude nuclear explosions have been experimentally simulated by irradiating spherical targets with eight beams from the Helios $CO_2$ laser in a chamber containing air at various pressures. The following experimental conditions have been established by various studies to closely match the requirements for proper simulation: (1) the laser-target ion expansion velocity can be adjusted to equal the weapon debris velocity; (2) background gas is preionized; (3) sufficient debris-ion kinetic energy is available; and (4) the explosions are spherically symmetric. In the absence of a background magnetic field, strong coupling between the kinetic energy of the target ions and the background air was not observed. The capabilities and limitations for high-altitude nuclear explosion simulations with high-power $CO_2$ laser are now better understood.

3258 **(UCRL—88961) Glass produced by underground nuclear explosions.** Schwartz, L.; Piwinskii, A.; Ryerson, F.; Tewes, H.; Beiriger, W. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 56p. (CONF-8308120—2). NTIS, PC A04/MF A01. Order Number DE84001423.

From 2. solid oxide fuel cell workshop; Upton, NY, USA (16 Aug 1983).

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Detonation of an underground nuclear explosive produces a strong shock wave which propagates spherically outward, vaporizing the explosive and nearby rock and melting, the surrounding rock. The vaporized material expands adiabatically, forming a cavity. As the energy is dissipated during the cavity formation process, the explosive and rock debris condense and mix with the melted rock. The melt flows to the bottom of the cavity where it is quenched by fractured rock fragments falling from above as the cavity collapses. Measurements indicate that about 740 tonnes of rock and/or soil are melted for every kiloton ($10^{12}$ calories) of explosive energy, or about 25% of the explosive energy goes to melting rock. The resulting glass composition reflects the composition of the unaltered rock with explosive debris. The appearance ranges from white pumice to dense, dark lava. The bulk composition and color vary with the amount of explosive iron incorporated into the glass. The refractory explosion products are mixed with the solidified melt, although the degree of mixing is variable. Electron microprobe studies of glasses produced by Rainier in welded tuff have produced the following results: glasses are dehydrated relative to the host media, glasses are extremely heterogeneous on a 20 μm scale, a ubiquitous feature is the presence of dark marble-cake regions in the glass, which were locally enriched in iron and may be related to the debris, optically amorphous regions provide evidence of shock melting, only limited major element redistribution and homogenization occur within the cavity.

# 50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

## 5001 Basic Studies

*REFER ALSO TO CITATION(S) 2045, 2046*

3259 **(DOE/BP—189) Pacific Northwest solar radiation data.** (Oregon Univ., Eugene (USA). Solar Radiation Monitoring Lab.). 1 Apr 1983. 148p. NTIS, PC A07/MF A01. Order Number DE84002335.

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In addition to presenting daily solar radiation data, this report discusses the data analysis process and the accuracy of the data. This discussion is structured as an overview of solar radiation in the Pacific Northwest with the hope of giving an intuitive feeling for the data. A brief historical sketch is first presented outling

the establishment of the monitoring network and detailing some of the motivation for creating the network. The data analysis procedures are then outlined showing what happens once the data is received and explaining the checks made to ensure the accuracy of the data. Next the calibration of the sensors is discussed. Then a few results obtained from our analysis of the data are described, including comparisons with other sites and frequency distributions. The data for 1982 are compared with that from the previous years in an attempt to identify important deviations from the average behavior. In particular we look at the possible effect on the data of the volcanic eruption of El Chichon in Mexico. The last section before the data concerns empirical correlations determined for the Pacific Northwest. These correlations are used as the first step to determine the amount of solar radiation on a tilted surface. This is the first time that these correlations have been derived for the Pacific Northwest.

3260 **Teleconnections with tropical precipitation surges.** Reiter, E.R. (Department of Atmospheric Sciences, Colorado State University, Fort Collins, Colorado 80523). *Journal of the Atmospheric Sciences;* **40**: No. 7, 1631-1658(Jul 1983). Contract AC02-76EV01340.

Precipitation surges in the equatorial Pacific "dry zone" (as delineated in a study by Doberitz) reveal statistically significant teleconnections with midlatitude tropospheric flow patterns during all seasons. These connections are strongest, however, during winter and agree with linear numerical model results. There is evidence that deep troughs in the central North Pacific antecede precipitation surges in the equatorial dry zone during that season, suggesting the possibility of triggering of such surges by middle latitude planetary-wave perturbations. Nonlinear numerical model results also indicate that the midlatitude planetary-wave response is strongest when North Pacific cold sea-surface temperature anomalies and equatorial East Pacific warm anomalies are present simultaneously.

3261 **Evaporation-limited tropical temperatures as a constraint on climate sensitivity.** Hoffert, M.I.; Planery, B.P.; Callegari, A.J.; Hsieh, C.T.; Wiscombe, W. (Department of Applied Science, New York University, New York 10003). *Journal of the Atmospheric Sciences;* **40**: No. 7, 1659-1708(Jul 1983). Contract AC02-81EV10610.

Studies of paleoclimate and modern observations indicate that evaporative effects limit thermal response in equatorial regions. We develop a latitude-resolved, steady-state energy balance model which incorporates the effect of an evaporative constraint on the variation of equatorial temperature with solar luminosity. For a diffusive model of surface heat transport the constraint requires the diffusion coefficient to vary with insolation. We find that the movement of the iceline with insolation is four times larger than in standard energy balance models with a constant thermal diffusion coefficient. This is a consequence of the global energy blanace which forces temperature changes to occur at high latitudes when they are evaporatively buffered at the equator. Nonlinear temperature-ice albedo feedback at high latitudes then amplifies the response leading to greater sensitivity in the vicnity of current climate.

## 5002 Chemicals Monitoring And Transport

*REFER ALSO TO CITATION(S) 1800, 1853, 1862, 1879, 1880, 1881, 2884, 3050, 3409, 4014*

3262 **(AD-A—131527/4) Chemical characterization and toxicologic evaluation of airborne mixtures. Chemical characterization of combusted inventory red and violet smoke mixes. Final report 1981-1982.** Rubin, I.B.; Buchanan, M.V.; Moneyhun, J.H. (Oak Ridge National Lab., TN (USA)). Oct 1982. 49p. (ORNL/TM—8810). NTIS, PC A03/MF A01.

3263 **(CONF-821054—2) Climate-chemistry connection.** Broecker, W.S.; Peng, T.H. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory; Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 32p. NTIS, PC A03/MF A01. Order Number DE84001950.

From 4. symposium on climate processes: sensitivity to solar irradiance and CO/sub 2/; Palisades, NY, USA (25 Oct 1982).

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The impacts on ocean chemistry of a variety of scenarios capable of producing the 90 x $10^{-6}$ atmosphere glacial to interglacial increase in $CO_2$ are explored. It is shown that each scenario produces a unique combination of $^{13}C$, Cd, $O_2$ and $CaCO_3$ dissolution responses. Thus, once we have reliable ocean wide records of these parameters, it should be possible to greatly reduce the list of those scenarios capable of explaining this $CO_2$ change. If our present information regarding these records is correct, then the only acceptable hypotheses are (1) shelf deposition, (2) Redfield ratio change plus forest growth or (2) phosphorite deposition plus forest growth. When global cadmium records become available further cuts will be possible. 17 references, 11 figures.

3264 **(DOE/ER/60055—T1) Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983.** (Pennsylvania State Univ., University Park (USA)). 1983. Contract AC02-82ER60055. 9p. NTIS, PC A02/MF A01. Order Number DE84000582.

Purpose of the studies were to provide new information on the interconversion of pollutants from the gaseous to the condensed phase. More information were obtained on mechanisms of cluster formation, leading to the production of prenucleation embryos, rates of phase transformation, and the thermochemical properties and photochemical stability of the species involved. Systems studied included nitric acid, ammonia, sulfuric acid, carbonic acid, etc. (DLC)

3265 **(DP-MS—83-14) Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models.** Murphy, C.E. Jr.; Lorenz, R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 19p. (CONF-8310174—2). NTIS, PC A02/MF A01. Order Number DE84001952.

From Forest environmental measurements conference; Oak Ridge, TN, USA (23 Oct 1983).

A method is described for estimating flux densities and deposition of gaseous pollutants for a period of a year or more, using data collected for a period of a few days. The estimates are based on models which characterize the transfer of gases from the atmosphere to the vegetation as a series of resistances and then use linear statistical submodels based on experimental data to relate the resistances to the surrounding environment. The models are shown to fit the experimental data reasonably well. Annual values calculated for a young loblolly pine plantation were: evaporation 63.2 cm, carbon dioxide exchange 31.5 t/ha, and sulfur dioxide exchange 120 gm/ha. 17 references.

3266 **(FFI-TN-VM—380) $CO_2$- budget in greenhouses with $CO_2$- addition.** Throndsen, T. (Forsvarets Forskningsinstitutt, Kjeller (Norway)). Nov 1979. 12p. (In Norwegian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751475.

Plant production in greenhouses in Norway is a very energy demanding activity and possible methods to reduce the energy consumption have been studied. In principle one has three possibilities: improve the efficiency, use alternative energy sources or to increase plant production without increasing the energy consumption. The beneficial effects of $CO_2$ enrichment on the yield and quality of many glasshouse crops are now a well established fact. The $CO_2$ requirements in enriched glasshouse atmospheres are governed by the need to replace $CO_2$ taken up by the plants during photosynthesis, $CO_2$ lost to outside air through leakage and ventilation, and duration of enrichment periods. For commercial purposes the $CO_2$ concentration is kept at desired levels by constant $CO_2$ supply from generators burning hydrocarbon fuels. However, air leakage is not constant, and will in calm weather reach very low value, resulting in high concentrations of $CO_2$ and acompanying toxic gases which in extreme cases may be hazardous to plants. The work presented is part of a project: $CO_2$ and heat from charcoal - possible applications in greenhouses. 3 drawings.

3267 **(IVL-B—713) Literature survey of the composition and of the acute effects of the exhaust gases of Diesel engines.** Moeller, L.; Werner, J. (Institutet foer Vatten- och Luftvaardsforskning, Stockholm (Sweden)). Dec 1982. 57p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751418.

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The compostion of the exhaust gases of Diesel engines is accounted for. The chemical and technical factor which affect the composition are listed. The biological effects are presented and the acute effects of exhaust gases are pointed out.

3268 **(KTM/E-D—12) Industrial local exhaust systems.** (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1982. 244p. (In Finnish). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83751445.

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The research report includes fundamentals and planning guides for industrial ventilation as well as some examples of the efficient local exhaust systems. The efficiency of some local exhaust systems was studied in industry circumstances. The performance of ventilation, the energy consumption and the work air quality in seven welding workshops equipped with local exhaust (high or low pressure) were clarified. It is benefitable to favour the local exhaust industrial ventilation. The local exhaust systems save energy almost without exception. Efficient local exhaust systems usually decrease investment cost of new ventilation installation because of lower ventilation and heating requirements. The effects of correctly planned local ventilation on work air quality are lways positive. Local exhaust decreases the dispersion of pollutants in work air. By using local exhaust systems for emission control it is usually possible to reduce the personal exposure even more than 90%. The measurements and calculations for welding workshop show that the fume exposure of welders who don't use local exhaust is, in an average, five times greater than the exposure of welders with local exhaust. With the dilution ventilation it is practically impossible to reach the same air quality as with the local ventilation. This is due to the unrealistic high investment and energy costs. Also the draft caused by the high air velocities is a harmful factor.

3269 **(ORNL/TM—8414) Evaluation of developmental industrial hygiene instrumentation at the University of Minnesota-Duluth gasifier.** Schuresko, D.D.; Hawthorne, A.R.; Vo-Dinh, T.; Gammage, R.B.; Dreibelbis, W.G.; Van Hoesen, S.D. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 48p. NTIS, PC A03/MF A01. Order Number DE84002500.

Several types of monitors under active development for reliable and compound-specific measurement of fugitive emissions from coal gasification processes in real- or near-real-time were tested during gasifier run periods. The primary concerns were aromatic vapors, respirable aerosols from coal tar, and polynuclear aromatic (PNA) laden tars and oils on contaminated surfaces. The monitors tested include: (1) a second-derivative uv-absorption spectrometer (microcomputer controlled) for monitoring specific aromatic vapors; (2) an integrating, badge-sized passive sampler for airborne high-boiling PNA vapors; (3) a light pipe luminoscope for quantitative fluorometric examination of the skin; and (4) a portable fluorometric spotter for detecting PNA surface contamination. (ACR)

3270 **(PB—83-241968) Harmonization of methods for measurements of $SO_2$. Final report.** Muylle, E.P.; Peperstraete, H.J. (Commission of the European Communities, Luxembourg). [nd]. 31p. (EUR—8052-EN). NTIS, PC E03/MF E03.

The aim of this contract was a study of the applicability of $SO_2$ calibration gases in steel cylinders for the calibration and intercomparison of different instrumental methods of measuring ambient $SO_2$ levels. The study was carried out in three steps: A preliminary study of the stability of the $SO_2$-air mixtures in the cylinders, a limited pilot-experiment in the framework of the Benelux -F.R. Germany (Four Countries), and a complete experiment within the European Community.

3271 **(PB—83-250340) Source apportionment methods applied to the determination of the origin of ambient aerosols that affect visibility in forested areas.** Stevens, R.K.; Dzubay, T.G.; Lewis, C.W.; Shaw, R.W. Jr. (Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Sciences Research Lab.). Aug 1983. 38p. (EPA—600/D-83-113). NTIS, PC A03/MF A01.

An aerosol characterization, visibility, and receptor modeling study was conducted in the Shenandoah Valley, VA between July 14 and August 15, 1980. The objectives of this study were to: (1) determine the origin of the ambient particles, (2) determine the major chemical species contributing to the light extinction coefficient, (3) evaluate analytical methods to characterize aerosols, and (4) provide data for comparison with chemical composition of aerosols collected in the Great Smoky Mountains and in the Abastumani Mountains of Georgian Soviet Socialist Republic. The factor analysis grouping along with additional supporting analytical data suggests the identity of emission sources contributing the fine and coarse particles measured in the Shenandoah Valley. From the elemental composition of the fine particles and trajectory analysis, it is inferred that the sulfate's origin is mainly coal-fired power plants.

3272 **(PB—83-252825) Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83.** Richards, L.W.; Anderson, J.A.; Blumenthal, D.L.; Duckhorn, S.L.; McDonald, J.A. (Sonoma Technology, Inc., Santa Rosa, CA (USA)). Jun 1983. 95p. NTIS, PC A05/MF A01.

Acid deposition has long been a source of concern in Scandanavia, and more recently became a source of concern in the northeastern United States and the Maritime Provinces of Canada (Likens 1976). Relatively little attention was given to acid deposition in California beyond the immediate vicinity of industrial operations until the work of Liljested and Morgan (1978, 1981), but it is now becoming clear that the likelihood of adverse impacts in California is great enough that the problem deserves study. This report contains the results of a study conducted by Meteorology Research, Inc. and Sonoma Technology, Inc. for the California Air Resources Board. An instrumented aircraft was used to collect cloudwater samples, filter samples of submicron aerosol, and make other air quality and meteorological measurements in stratus clouds near the industrial areas of Los Angeles. Caltech conducted a parallel study for the CARB in which fog and rainwater samples were collected on the ground, and chemical analyses were performed for both the ground and airborne sampling.

3273 **(UCID—19822-Rev.1) Environmental assessment for spill tests of $NH_3$ and $N_2O_4$ at Frenchman Flat, Nevada Test Site. Revision 1.** Leitner, P.; Miller, G.; Shinn, J.H. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 68p. NTIS, PC A04/MF A01. Order Number DE84002108.

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Lawrence Livermore National Laboratory (LLNL) has assessed the environmental effects of a proposed series of liquefied ammonia ($NH_3$) and nitrogen tetroxide ($N_2O_4$) spill tests. This short-term program of field experiments is designed to simulate accidental releases of these materials from pressurized transport and storage vessels. The proposed location for this series of spill tests is Frenchman Flat on the Nevada Test Site (NTS). Frenchman Flat is a desert alluvial basin with a dry lake bed or playa at the center. No permanent facilities would be constructed and surface disturbance would be minimal. The major concern is for the effects of the experimental releases of $NH_3$ and $N_2O_4$, gases that are toxic at high concentrations. The scope of the tests is such that Nevada guidelines for significant emission rates would not be exceeded. A modified Gaussian plume model was used to compute the downwind range to various significant concentrations of $NH_3$ and $NO_2$. These calculations were then used to estimate the potential effects of the spill tests on natural vegetation and wildlife. The highest $NH_3$ and $NO_2$ concentrations would be largely confined to the barren playa. No threatened or endangered plant or animal species are present in the test area. 49 references.

3274 **(UCRL—89964) Response to W.W. Kellogg carbon dioxide and climatic change: implications for mankind's future.** Ellsaesser, H.W. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 19p. (CONF-8311100—1). NTIS, PC A02/MF A01. Order Number DE84002723.

From 12. international conference on global environmental problems; Chicago, IL, USA (24 Nov 1983).

The writer objects to the consensus that doubled $CO_2$ levels will lead to a global temperature increase of 3°C and the associated implications for mankind. In this paper he presents his reasons for doubting the majority view on two climatic feedback processes: (1) the ice-albedo feedback, and (2) the water vapor feedback. (ACR)

3275 **Stratospheric sulfate from El Chichon and the Mystery Volcano.** Mroz, E.J.; Mason, A.S.; Sedlacek, W.A. (Los Alamos National Laboratory, P. O. Box 1663, MS-J514, Los Alamos, New Mexico 87545). *Geophysical Research Letters;* **10**: No. 9, 873-876(Sep 1983).

Stratospheric sulfate was collected by high-altitude aircraft and balloons to assess the impacts of El Chichon and an unidentified volcano on the stratosphere. The Mystery Volcano placed about 0.85 Tg of sulfate in the northern hemisphere stratosphere. El Chicon injected about 7.6 Tg sulfate into the global stratosphere.

3276 **Atmospheric Bromine in the Arctic.** Berg, W.W.; Sperry, P.D.; Rahn, K.A.; Gladney, E.S. (National Center for Atmospheric Research, Boulder, Colorado 80307). *Journal of Geophysical Research;* **88**: No. C11, 6719-6736(20 Aug 1983).

We report the first measurements of both particulate and gas phase bromine in the Arctic troposphere. Data from continuous sampling of the Arctic aerosol over a period of 4 years (1976—1980) indicate that the bromine content in the aerosol averages 6 +- 4 ngBr/SCM (5 +- 3 pptm Br) for 9 months of every year. During the 3-month period between February 15 and May 15, however, we observed an annual sharp maximum in particulate bromine with levels exceeding 100 ngBr/SCM (82 pptm Br). The Arctic aerosol showed no bromine enrichment relative to seawater except for this 3 month peak period. During the bromine maximum, enrichment factors reached 40 with average values near 10. Calculations of the amount of excess bromine in the Arctic aerosol showed that over 90% of the peak bromine had an origin other than from direct bulk seawater injection. Total levels of gas phase bromine in the Arctic troposphere found during the peak aerosol period averaged 422 +- 48 ngBr/SCM (118 +- 14 pptv). Total bromine content during this period averaged 474 +- 49 ngBr/SCM with gas-to-particle ratios ranging from 7 to 18. A measurement under nonpeak conditions showed total bromine levels at <25 ngBr/SCM. The possibility that local contamination contributed to the seasonal development of the 3-month bromine peak was carefully considered and ruled out. Elevated particualte bromine levels, with peak values ranging from 22 to 30 ngBr/SCM, were also found at Ny-Alesund, Spitsbergen (Norway). The apparent seasonal nature of this bromine peak suggests that the large bromine maximum observed at Barrow is not an isolated or unique phenomenon characteristic of that sampling location.

3277 **Eye-safe tracking of oil fog plumes by UV lidar.** Eberhard, W.L. (NOAA Wave Propagation Laboratory, Boulder, Colorado 80303). *Applied Optics;* **22**: No. 15, 2282-2285(1 Aug 1983).

NOAA's Wave Propagation Laboratory operated a plume-tracking lidar during two field experiments investigating atmospheric dispersion in complex terrain. The lidar successfully acquired data on oil fog plume behavior by detecting the elastic backscatter of the pulsed output of a frequency-doubled ruby laser. This UV wavelength (0.3472 μm) met stringent eye safety restrictions. An analysis of signal and noise levels demonstrates that plume definition at a wavelength of 0.3472 μm is superior in many cases to that of 0.6943 μm when pulse energies are low enough to be eye-safe at the range to the plume. This is often true in spite of the high threshold set by the large molecular scatter from the ambient air at the UV wavelength. Backscatter coefficients of oil fog at the shorter wavelength were 1—4 x larger than at the longer wavelength.

## 5003 Radioactive Materials Monitoring And Transport

*REFER ALSO TO CITATION(S) 1962, 3298, 3300, 3401*

3278 **(AD-A—130931/9) ATR code improvements. Final report 15 Oct-31 Dec 79.** Woolson, W.A.; Huszar, L. (Science Applications, Inc., La Jolla, CA (USA)). 1 Aug 1982. 22p. (SAI—133-82-232-LJ). NTIS, PC A02/MF A01.

Modifications were made to the ATR code which will improve the delayed radiation dose model, permit user specification of the air density profile, and incorporate additional user convenience commands.

3279 **(K/PS—5027) Sampling and characterization of aerosols formed in the atmospheric hydrolysis of $UF_6$.** Bostick, W.D.; McCulla, W.H.; Pickrell, P.W.; Branam, D.A. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 1983. Contract W-7405-ENG-26. 7p. (CONF-831025—22). NTIS, PC A02/MF A01. Order Number DE84002430.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

When gaseous $UF_6$ is released into the atmosphere, it rapidly reacts with ambient moisture to form an aerosol of uranyl fluoride and HF. As part of our Safety Analysis program, we have performed several experimental releases of $UF_6$ (from natural uranium) in contained volumes in order to investigate techniques for sampling and characterizing the aerosol materials. The aggregrate particle morphology and size distribution have been found to be dependent upon several conditions, including the relative humidity at the time of the release and the elapse time after the release. Aerosol composition and settling rate have been investigated using isokinetic samplers for the separate collection of $UO_2F_2$ and HF, and via laser spectroscopic remote sensing (Mie scatter and infrared spectroscopy). 8 references.

3280 **(PNL—4822) PUREX environmental radiological surveillance - preoperational and operational support program conducted by Pacific Northwest Laboratory.** Sula, M.J.; Price, K.R. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1983. Contract AC06-76RL01830. 81p. NTIS, PC A05/MF A01. Order Number DE84002190.

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This report describes the radiological environmental sampling program that is being conducted at the US Department of Energy's (DOE) Hanford Site in support of resumed operation of the PUREX fuel processing plant. The report also summarizes preoperational radiological environmental data collected to date. The activities described herein are part of the ongoing Hanford Environmental Surveillance Program, operated by the Pacific Northwest Laboratory (PNL) for the DOE.

## 5005 Site Resource And Use Studies

*REFER ALSO TO CITATION(S) 2045, 2046*

## 5006 Regulations

*REFER ALSO TO CITATION(S) 1799*

3281 **(PB—83-252502) Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report.** Streib, E.W.; Fuerst, R.G.; Midgett, M.R. (Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Monitoring and Systems Lab.). Jun 1983. 52p. (EPA—600/4-83-026). NTIS, PC A04/MF A01.

In the spring and fall of 1981 the Quality Assurance Division (QAD) conducted its semi-annual National Audits for certain Stationary Source Test Methods. The audit materials consisted of a critical orifice for Method 5 (dry gas meter only), five simulated, liquid samples each for Method 6 ($SO_2$) and Method 7 (NOx), and two coal samples for Method 19. Laboratories participating in the

audits sent their data to the Source Branch and later received written reports comparing their results to EPA's. This was the first coal audit conducted by QAD. For the sulfur, ash, and moisture analysis, the participants' accuracy were consistently better for the higher concentration samples than for the lower concentration samples.

# 51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

## 5101 Basic Studies

*REFER ALSO TO CITATION(S) 1821, 3343*

3282 (DOE/ID—12098, pp 107-113) **New point interception frame for estimating cover of vegetation.** Floyd, D.A.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A new frame for sighting a dot grid onto vegetation is described. It consists of two superimposed string grids mounted one above the other on three adjustable legs. The method was compared to line interception in sagebrush/perennial bunchgrass vegetation in southeastern Idaho. For most species, cover estimates by the two methods were the same. Line interception gave higher cover estimates for shrubs because of the assumption that their foliage completely covered the area within their canopy outlines. The technique was fast, accurate, and objective.

3283 (DOE/ID—12098, pp 126-146) **Stability and succession in crested wheatgrass seedings on the Idaho National Engineering LAboratory.** Marlette, G.M.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Crested wheatgrass (Agropyron cristatum) has been used extensively for the revegetation of disturbed and depleted lands in the western United States. Its importance will probably increase as energy and mineral resource development necessitates the reclamation of semiarid ecosystems. Many semiarid ecosystems are managed with the assumption that the recovery process deterministically converges to a native climax community. Yet, some crested wheatgrass seedings have resisted the invasion of native species for as long as 50 years. Competition for soil moisture is generally regarded to be the primary factor that precludes the invasion of crested wheatgrass seedings by native species. Competition can be a factor in the stability of crested wheatgrass only if native species are sufficiently dispersed into the seedings. Seed dispersal and seed reserve data suggest that native species are limited or unavailable for recruitment within crested wheatgrass seedings. The probabilities of recruitment from seed reserves may favor crested wheatgrass as a self-maintaining vegetation for prolonged periods. Chance favors the maintenace of the monoculture rather than its successional replacement.

3284 (DOE/ID—12098, pp 182-197) **Baseline vegetation data for a controlled burn site.** Floyd, D.A.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Vegetal cover data were collected between June 3 and July 31, 1980 on an area that was selected for studying the effects of a controlled burn on the Idaho National Engineering Laboratory. The study area is located on a broad alluvial fan, which results in gradients of elevation, soil characteristics, and vegetation. The purpose of this project was to collect baseline data on the vegetation along this gradient. This report describes the sampling regime and location of sample plots. Summary tables of plant species and their cover estimates are included. The study area was dominated by Artemisia tridentata and Chrysothamnus viscidiflorus. Ten additional shrub species were identified. The most abundant grasses were Agropyron spicatum, Oryzopsis hymenoides, and Sitanion hystrix. Ten additional species of grasses were identified. Fifty forb species were identified on the area; the most abundant was Phlox hoodii. A discussion of the expected results of burning this area, based on the current literature, is included.

3285 (DOE/ID—12098, pp 283-286) **Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits.** Arthur, W.J.; Gates, R.J. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Research was initiated in November 1980 to determine the seasonal masses of soil ingested by pronghorn antelope (Antilocapra americana) and black-tailed jack rabbits (Lepus californicus) on the northwestern sections of the Idaho National Engineering Laboratory (INEL). Since a portion of the study area is scheduled to have a controlled burn in summer 1982, information obtained from this study should be useful for comparing changes in soil intake rates during changes in vegetation patterns. By relating soil and forage intake rates to trace element (Ca, Co, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, K, Si, Sr, V and Zn) concentrations in these media, the relative importance of these two pathways can be evaluated in relationship to elemental intake. Similar applications of the data will be used to determine the role of soil versus vegetation intake and their relationship to radionuclide intake by pronghorn and jack rabbits on the INEL.

3286 **Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis.** MacCracken, J.G. (Colorado State Univ., Fort Collins); Hansen, R.M. *Great Basin Naturalist;* **42**: No. 1, 45-49(Mar 1982). Contract AS07-76ID01526.

Seasonal foods of coyotes (Canis latrans) inhabiting the Idaho National Engineering Laboratory site were examined using step-wise discriminant analysis. Significant differences ($P<0.01$) were detected among seasons in food consumption by coyotes, where univariate statistical analysis failed to recognize differences. Recognition of seasonal changes in foods consumed by coyotes is essential to understanding coyote feeding strategies. The role opportunistic behavior plays in coyote food selection on the study area is questioned.

3287 **Dynamics of soil-forming processes in the Arctic.** Ugolini, F.C. (Univ. of Washington, Seattle); Zachara, J.M.; Reanier, R.E. pp 103-115 of Proceedings of the fourth Canadian permafrost conference. French, H.M. (ed.). Ottawa, Canada; National Research Council of Canada (1982). (CONF-810317—).

From 4. Canadian permafrost conference; Calgary, Alberta, Canada (2 Mar 1981).

The process of podzolization and the formation of Spodosol-like soils in well-drained tundra has been questioned. Standard chemical analyses fail to distinguish between Spodosol-like soils in boreal forest and tundra. As an alternate method to assess present soil porcesses, tension lysimeters were placed under the horizons of Spodosol-like soils at three sites to collect in situ soil solution. Soil solutions obtained by irrigating the soil with deionized water were analyzed for pyrophosphate and dithionite extractable Fe and Al. In the boreal forest, solid phase and soil solution analyses indicate that the process of podzolization has occurred and is currently occurring. In the boreal forest and tundra transition site, analyses show that podzolization occurs sporadically in wet years. In the tundra, conventional analyses indicate that podzolization has occurred; soil solution indicates a weak expression of this process. This study reveals the existence of latitudinal pedogenic gradients related to climate, productivity and biomass degradation, and mineral weathering. Tension lysimetry permits evaluation of soil development rates in the Arctic for the first time.

## 5102 Chemicals Monitoring And Transport

*REFER ALSO TO CITATION(S) 1794, 2900, 3416*

3288 (DOE/ID—12098, pp 409-416) **Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities.** Arthur, W.J.; Craig, E.H.; Craig, T.H.; Powers, L.R. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

During summer 1981 soil, vegetation, herbivore tissue, coyote feces and raptor casting, feather, shell and tissue samples were collected near the Idaho National Engineering Laboratory Chemical Processing Plant, the site of a future coal-fired plant. Samples were also collected at two control areas in Idaho and in the vicinity of two already existing coal-fired plants. All samples were analyzed for Al, Sb, As, Ba, Be Bi, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P ($PO_4$), K, Si ($SiO_2$), Ag, Na, Sr, Sn, V, Zn, F, Hg, and Se. Primary research objectives are to determine: (1) currently existing levels of trace elements in the INEL environment prior to coal plant operations; (2) possible biomagnification of trace elements in various terrestrial ecosystem components; (3) differences in trace element concentrations within each media at varying distances and directions from the coal-fired plants; and (4) which tissues are good indicators of elemental concentrations.

3289 **(PB—83-240432) Evaluation of radium and toxic element leaching characteristics of Florida phosphogypsum stockpiles. Report of investigations/1983.** May, A.; Sweeney, J.W. (Bureau of Mines, Tuscaloosa, AL (USA). Tuscaloosa Research Center). Jun 1983. 24p. NTIS, PC A02/MF A01.

The Bureau of Mines conducted studies to determine if phosphogypsum, a waste material from the processing of phosphate rock, contains hazardous toxic materials as defined by the Environmental Protection Agency (EPA) and whether leaching of these toxic materials and radium may occur. Samples of the phosphogypsum stockpiled material were evaluated using the EPA extraction procedure, atomic absorption, neutron activation, X-ray diffraction, and chemical and physical means. Radiological tests performed used both the germanium-lithium and emanation methods.

3290 **(PB—83-241737) Protocol for bioassessment of hazardous waste sites. Final report.** Porcella, D.B. (Tetra Tech, Inc., Lafayette, CA (USA)). Jul 1983. 142p. (TC—3547-1). NTIS, PC A07/MF A01.

The bioassessment protocol is one of several tools, including chemical analysis and field study, that can be used to characterize the potential environmental risk associated with hazardous waste sites. The protocol can be applied to priority ranking for deciding the need for cleanup of a site compared to other sites, and to assess cleanup effectiveness by testing for potential hazards at the site boundaries or along a sampling transect. Bioassessment involves using defined biological tests to determine the biological response to concentrations of the biologically active components of soil and water samples from a hazardous waste site. The tests are described in the report Appendix and include aquatic and terrestrial tests.

3291 **(PB—83-250894) Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations.** Olsen, R.S.; Gruzensky, W.G.; Bullard, S.J.; Henry, J.L. (Bureau of Mines, Albany, OR (USA). Albany Research Center). Jul 1983. 31p. NTIS, PC A03/MF A01.

Although aluminum is easily leached from calcined clay with boiling mineral acids, the presence of fines and slimes in the leached residue has hindered the application of acid leaching processes. A feed preparation method was, therefore, devised that provided a dense, smooth-surfaced, fine-grained clay.

## 5103 Radioactive Materials Monitoring And Transport

*REFER ALSO TO CITATION(S) 1941, 2017, 3225, 3274, 3283, 3319*

3292 **(CEA-R—5211) In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant.** Masson, M.; Leon, R.; Miramand, P.; Germain, P. (Compagnie Generale des Matieres Nucleaires (COGEMA), Centre de la Hague, 50 - Cherbourg (France)). 1983. 14p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704317.

The introduction of 10 lots of 100kg of mussels in La Hague waters made it possible to investigate the in situ uptake kinetics of $^{106}Ru + {}^{106}Rh$ released by the fuel reprocessing plant of La Hague during 1 year. Equilibrium was reached within 1 - 3 months, whatever the time of introduction and the amounts released. The removal of the mussels labelled at La Hague to a remote area made it possible to calculate the biological half-life of $^{106}Ru + {}^{106}Rh$, viz from 16 to 18 days.

3293 **(CONF-821053—5) Batch method of measuring sorption ratios.** Meyer, R.E. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE84002066.

From Workshop on standardization of methods for measuring migration of radionuclides in geomedia; Berlin, F.R. Germany (25 Oct 1982).

In determining sorption ratios in measurements of rock-nuclide interactions, the test-tube batch method is the most widely used technique. The solid-solution ratio should be varied. Tube or container sorption may be a problem. The system, under study should be investigated by two different methods. Adsorption of Sr(II) and Np(V) are used as examples. (DLC)

3294 **(DOE/ID—12098) Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.** Markham, O.D. (ed.). (USDOE Idaho Operations Office, Idaho Falls). Jun 1983. 444p. NTIS, PC A19/MF A01. Order Number DE83016956.

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Progress is reported in research on: the baseline ecology of the Idaho National Engineering Laboratory (INEL), the effects of disturbance on animal and plant communities, and the behavior of radionuclides in the environment surrounding radioactive waste sites. Separate abstracts have been prepared for individual reports. (ACR)

3295 (DOE/ID—12098, pp 1-13) **Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho.** Arthur, W.J.; Markham, O.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Radioecological research conducted at the Idaho National Engineering Laboratory Subsurface Disposal Area (SDA) has estimated the quantity of radionuclides transported by various ecosystem components and evaluated the impact of subsurface disposal of radioactive waste on biotic species inhabiting the area. Radiation dose rates received by small mammals ranged from 0.4 to 41790 mrad/day. Small mammal soil burrowing was an upward transport mechanism for transuranic radionuclides. Seventy-seven uCi of radioactivity occurred in SDA vegetation annually. None of these ecological vectors contributed appreciable quantities of radioactive contamination to the environment surrounding the SDA. (JMT)

3296 (DOE/ID—12098, pp 21-46) **Population ecology of small mammals on the radioactive waste management complex, Idaho National Engineering Laboratory.** Groves, C.R.; Keller, B.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Species composition, diversity, biomass, population dynamics, absolute density, and movements of small mammal populations were examined on and adjacent to a solid radioactive waste disposal area in southeastern Idaho. The 15-month live-trapping study resulted in marking 2384 individuals representing 10 species of small mammals. Three vegetation types were sampled: crested wheatgrass (Agropyron cristatum) and Russian thistle (Salsola kali) habitats on the disposal area and native sagebrush (Artemisia tridentata) habitat surrounding the disposal area. The deer mouse (Peromyscus maniculatus) was the most common rodent in both disposal area habitats as well as the adjacent sagebrush habitat; Ord's kangaroo rat (Dipodomys ordii) was also an abundant rodent in all vegetation types. The montane vole (Microtus montanus) was common only in crested wheatgrass stands on the disposal area. The annual total small mammal biomass of 346 kg for the entire disposal area represents a potentially large vector for movement of radionuclides off the disposal area. However, the number of animals known to contact waste areas and traverse at least 50 m beyond the perimeter of the SDA appears to be small (8.7%).

3297 (DOE/ID—12098, pp 47-55) **Small mammal density and movement on the SL-1 disposal area, Idaho National Engineering Laboratory.** Filipovich, M.A.; Keller, B.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

This study was initiated to examine the population composition, density and food habits of small mammals on a radioactive waste disposal area. Population parameters of small mammals were studied at 3-month intervals on and adjacent to the SL-1 radioactive waste disposal area (1.4 ha) and a 0.3 ha control area between August 1981 and February 1982 with mark-release methods. Both areas have crested wheatgrass (Agropyron cristatum) stands surrounded by sagebrush steppe. Species composition on the SL-1 and control area was similar to that found on the Subsurface Disposal Area at the Idaho National Engineering Laboratory. Considerable use by small mammals of the perimeter of the crested wheatgrass stands was found on both the SL-1 and control area. Additionally, deer mice (Peromyscus maniculatus) and Ord's kangaroo rats (Dipodomys ordii) that frequent the crested wheatgrass stands of the SL-1 and control area were often captured over 100 m from the crested wheatgrass stands. Thus, future research efforts will focus on examining the intensity of perimeter use and food habits of rodents residing on and adjacent to the SL-1. Results of this study will be used to evaluate ecological conditions that affect small mammal use of radioactive waste disposal areas.

3298 (DOE/ID—12098, pp 56-63) **Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area.** Arthur, W.J.; Grant, J.C.; Markham, O.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

During summer 1981 and 1982, radioecological research was conducted at the Stationary Low Power Reactor-1 radioactive waste disposal area to: (1) identify vegetation, wildlife, and invertebrate species occurring at or using the area; (2) determine radionuclide concentrations in these various ecosystem components; and (3) to evaluate their respective roles in radionuclide uptake and transport through the surrounding environment. Cesium-137 concentrations detected in surface soils, small mammal excavated soils and small mammal tissues collected at the waste disposal site were significantly ($P \leqq 0.05$) greater than control area samples. Strontium-90 and $^{235}U$ analyses of SL-1 and control area samples and projections of total mass of ecosystem components in SL-1 area will be completed in summer of 1983 at which time estimates will be made on the total quantity of fission and activation radionuclides occurring in ecological media at the SL-1 waste disposal area.

3299 (DOE/ID—12098, pp 64-74) **Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area.** Veith, R.D.; Keller, B.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study of the population ecology of three species of carrion beetles (Nicrophorus hecate, N. hybridus, N. marginatus) was initiated on a solid radioactive waste disposal area on the Idaho National Engineering Laboratory in June 1981. Successive mark and recapture procedures were used to document redistribution of individually numbered adults. During the first summer of research, 1410 individuals were captured in baited pitfall traps, marked, and released during three 12-day sampling periods. Eighty marked individuals were subsequently caught at sampling stations located at varied distances from the site of release, but half of the recaptures occurred within 66.2 m of this point, and a decline in number of recaptures was observed with increasing distance. Capture of beetles at trapping points was related to the prevailing wind direction. Based upon the observed densities, local populations of these species could have an important role in the organic breakdown of small mammals that die on or adjacent to the disposal area. Thus, they may also be an important vector in the redistribution of radionuclides present in small mammals taht become contaminated prior to death.

3300 (DOE/ID—12098, pp 75-82) **Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area.** Halford, D.K. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Movements and densities of rodents at a liquid radioactive waste disposal area were studied from June to September 1981 using trap line and assessment line techniques. The average distance between points of successive capture was 42 +- 25 (SD) m for deer mice (Peromyscus maniculatus) and 37 +- 21 m for kangaroo rats (Dipodomys ordii). Densities of deer mice averaged 10.2/ha with a population estimate of 57 within the area of rodent captures. The population estimate of 4 species of small mammals at the waste pond complex was 93. Radionuclide concentrations averaged 133 +- 97 pCi/g for rodents captured inside the disposal area boundary, 18 +- 22 pCi/g for those captured outside of the dispoal area fence and 0.50 +- 0.6 pCi/g for control animals. Species captured outside of the waste area boundary had significantly lower ($P < 0.05$) radionuclide concentrations than those captured inside the waste area. The gamma emitting radioactivity inventory ($^{137}Cs$, $^{134}Cs$, $^{60}Co$ and $^{65}Zn$) in rodents at the liquid waste disposal area was estimated to be about 162 nCi.

3301 (DOE/ID—12098, pp 278-282) **Black-tailed jack rabbit movements and habitat utilization at the Idaho National Engineering Laboratory radioactive waste management complex.** Grant, J.C. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

In June 1982, a study of black-tailed jack rabbit (Lepus californicus) ecology was initiated at the Idaho National Engineering Laboratory Radioactive Waste Management Complex (RWMC). This study will provide data necessary to evaluate the role of jack rabbits in radionuclide transport away from the Subsurface Disposal Area of the RWMC. Primary goals are to document radionuclide concentrations in jack rabbit tissues, and determine population size, movement patterns, habitat use, and food habits of jack rabbits inhabiting the RWMC area. Study design and prelimianry results are discussed.

3302 **(Juel—1821) Quantifying remarks to the question of uncertainties of the 'general dose assessment fundamentals'.** Brenk, H.D.; Vogt, K.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Abt. Sicherheit und Strahlenschutz). Dec 1982. 211p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751357.

Dose prediction models are always subject to uncertainties due to a number of factors including deficiencies in the model structure and uncertainties of the model input parameter values. In lieu of validation experiments the evaluation of these uncertainties is restricted to scientific judgement. Several attempts have been made in the literature to evaluate the uncertainties of the current dose assessment models resulting from uncertainties of the model input parameter values using stochastic approaches. Less attention, however, has been paid to potential sources of systematic over- and underestimations of the predicted doses due to deficiencies in the model structure. The present study addresses this aspect with regard to dose assessment models currently used for regulatory purposes. The influence of a number of basic simplifications and conservative assumptions has been investigated. Our systematic approach is exemplified by a comparison of doses evaluated on the basis of the regulatory guide model and a more realistic model respectively. This is done for 3 critical exposure pathways. As a result of this comparison it can be concluded that the currently used regulatory-type models include significant safety factors resulting in a systematic overprediction of dose to man up to two orders of magnitude. For this reason there are some indications that these models usually more than compensate the bulk of the stochastic uncertainties caused by the variability of the input parameter values.

3303 **Determination of concentrations of selected radionuclides in surface soil in the US.** Myrick, T.E.; Berven, B.A.; Haywood, F.F. (Oak Ridge National Lab., TN). *Health Physics;* **45**: No. 3, 631-642(Sep 1983). Contract W-7405-ENG-26.

Background radionuclide concentrations in surface soil across the US have been measured by the Remedial Action Survey and Certification Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory (ORNL). These measurements have been made as part of the ORNL program of radiological surveillance of mactive uranium mills and sites formerly utilized during Manhattan Engineer District and early Atomic Energy Commission projects. The background soil sampling program involved determination of $^{226}Ra$, $^{232}Th$ and $^{238}U$ concentrations in surface soil samples for comparative purposes to determine the extent of contamination present at the survey sites and surrounding off-site areas. The sampling to date has provided background information at 356 locations in 33 states. The nationwide average concentrations of $^{226}Ra$, $^{232}Th$ and $^{238}U$ in surface soil were determined to be 1.1, 0.98 and 1.0 pCi/g, respectively. This paper summarizes the results of these background measurements and provides a brief analysis of regional differences and similarities in data values.

3304 **$^{90}Sr$ and $^{137}Cs$ in soil and biota of fallout areas in southern Nevada and Utah.** Romney, E.M.; Lindberg, R.G.; Kinnear, J.E.; Wood, R.A. (Univ. of California, Los Angeles). *Health Physics;* **45**: No. 3, 643-650(Sep 1983). Contract AC03-76SF00012.

Measurements of $^{90}Sr$ and $^{137}Cs$ in soil, vegetation and small mammals were made periodically at sites in southern Nevada and Utah that were contaminated by radioactive fallout from nuclear detonations at the Nevada Test Site (NTS) as well as from global sources. Results from a survey in 1980 indicate that both of these fallout-derived radionuclides have remained primarily within the top 5-cm layer of undisturbed soil in these arid land areas. Trace amounts of $^{90}Sr$ and $^{137}Cs$ were measured in soil and biota samples. The $^{90}Sr$ concentrations in jackrabbit and rodent bone samples in 1980 varied within the range of 2-8 pCi/g ash. The $^{137}Cs$ concentrations in muscle-tissue samples were generally less than 1.5 pCi/g ash. Comparisons of data obtained periodically since the early 1950s show that measured concentrations of $^{90}Sr$ in bone tissues have been highly variable in trace amounts, and that the concentration attenuation appears to be following radioactive decay of this radionuclide.

3305 **Examination of the environmental half-time for radionuclides deposited on vegetation.** Miller, C.W.; Hoffman, F.O. (Oak Ridge National Lab., TN). *Health Physics;* **45**: No. 3, 731-744(Sep 1983). Contract W-7405-ENG-26.

After radionuclides are deposited on vegetation, environmental removal processes combine with radioactive decay to reduce the quantity of initial contamination. The time in which one-half of the radioactivity is removed from vegetation by environmental processes alone is refered to as the environmental half-time, T/sub w/. For long-lived radionuclides, the dose to man via ingestion of contamiated terrestrial foods may be directly influenced by values of T/sub w/, provided that environmental removal processes dominate root uptake and time is sufficiently long between initial exposure of vegetation and harvest. Values of T/sub w/ reported in the literature for various radionuclides and methods of deposition are examined. Factors affecting the variability of T/sub w/ are related in part to the physicochemical form of the depositing substance, vegetation type and growth form, climate, season, and experimental procedure.

3306 **Radioecology: nuclear energy and the environment.** Whicker, F.W.; Schultz, V. Boca Raton, FL; CRC Press, Inc. (1982). 440p. CRC Press, Inc., Boca Raton, FL $74.50 per volume.

From review by John P. Witherspoon, Oak Ridge National Laboratory, in Ecology, Vol. 64, No. 4 (Aug 1983).

Radioecology is the field of study in which elements of physical and biological sciences are combined to pursue knowledge of radioactivity in the environment, including movement of radioactive materials and the effects of ionizing radiation on populations and on ecological organization. Volume I contains chapters on ecological principles, radiological principles, environmental radioactivity and radionuclide behavior in ecosystems. Chapter Four on environmental radioactivity characterizes sources, types, and amounts of material and man-made radioactive materials and radiation in the environment. Concepts of radionuclide behavior in ecosystems and behavior (movements and concentrations) of several important element groups in selected ecosystems are surveyed. A chapter on methods used for quantitative predictions of radionuclide transport in the environment gives a reasonably complete treatment to environmental transport processes, radionuclide kinetics in ecosystem compartments, and the use of transport models. Two chapters summarize the known effects of ionizing radiation on species, populations, and higher levels of ecological organization. This information is put into perspective in terms of risk and other consequences. Both volumes are well referenced. Appendices contain listings of major proceedings and books, reviews of specific radionuclides in the environment, and physical data used to characterize radionuclides. The authors succeed in presenting an excellent survey of a broad field of study, and these volumes should serve as a standard reference work on radioecology for a long while.

## 5105 Site Resource And Use Studies

*REFER ALSO TO CITATION(S) 1978, 1987, 1988, 1989, 2040, 3284, 3288, 3342, 3427*

3307 (DOE/ID—12098, pp 89-106) **Survey and assessment of the rare vascular plants of the Idaho National Engineering Laboratory.** Cholewa, A.F.; Henderson, D.M. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

In 1973, when the Endangered Species Act was passed, all federal agencies were required to consider in their management plans all species listed by the US Fish and Wildlife Service in their reviews of species considered for endangered and threatened status. In 1981, the Department of Energy contracted with the University of Idaho for a survey of rare plants on the Idaho National Engineering Laboratory site in southeastern Idaho. After one field season two taxa currently under federal review for endangered or threatened status, three taxa on the state watch list, and one taxon previously unknown to occur in Idaho were found. Populations of these taxa were surveyed, whenever possible collections were made, and actual and potential threats were evaluated.

3308 (DOE/ID—12098, pp 114-126) **Comparison of three methods for estimating vegetal cover.** Floyd, D.A.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Vegetal cover data were collected in sagebrush-steppe vegetation using three techniques: line interception, Daubenmire's cover-class estimation, point interception, using a new point sighting method. Cover estimates and times required to obtain confidence limits by the three methods were compared. Daubenmire's cover-class estimation method gave high estimates of grass cover, because actual cover values of grasses tend to be asymmetrically distributed and thus violate a basic assumption of this method. Most of the significant differences among sets of cover estimates were a result of cover-class estimation giving estimates that were different from those of both the other methods. Cover-class estimation gave significantly different estimates for shrubs, grasses, forbs, lower plants, and litter. Line interception gave high estimates of shrub cover, because of the assumption that shrubs cover all the area within the outlines of their canopies. Line interception and point interception estimates of cover for most othe species were not significantly different, but line interception required about 35 percent more sampling time to achieve the same precision as point interception. We concluded that the new point sighting method was the most effective method for estimating cover in sagebrush-steppe vegetation.

3309 (DOE/ID—12098, pp 147-156) **Idaho National Engineering Laboratory vegetation data file.** Wilkosz, R.J.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

The format of a computerized file of vegetation data from three studies conducted on the Idaho National Engineering Laboratory is described. The major objective of this project was to produce an error-free computerized record of the long term vegetation data from the macrotransects that were established in 1950. The data are stored on magnetic tape. A list of the scientific names that correspond to the species codes used in the data file is included.

3310 (DOE/ID—12098, pp 157-161) **Sagebrush distributions on the Idaho National Engineering Laboratory.** Shumar, M.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Sagebrush shrubs of the genus Artemisia are dominant in vegetation on many western rangelands. At least six shrub species of the genus and three subspecies of Artemisia tridentata are found on rangelands of the upper Snake River Plain in southeast Idaho. This project produced a map showing the approximate distributions of species and subspecies of Artemisia on the central and eastern portions of the Idaho National Engineering Laboratory in southeastern Idaho. Sagebrush samples were collected along roads and trails within the Site boundary and taken to the laboratory for identification. Three species of Artemisia and two subspecies of A. tridentata have been collected and identified to date. The distributions of A. tridentata subspecies tridentata and A. tridentata subspecies wyomingensis form a complex pattern on eastern portions of the INEL. A. nova and A. tripartita have also been encountered. Plans for future sampling are discussed.

3311 (DOE/ID—12098, pp 172-181) **FActors affecting the distributions of two subspecies of big sagebrush.** Shumar, M.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

The distributions of sagebrush taxa are affected by climate and soil factors. This study was designed to determine whether the distributions of pure and mixed stands of Artemisia tridentata tridentata and Artemisia tridentata wyomingensis are related to soil moisture, plant water stress, or various other soil factors and to relate the distributions of these sagebrush taxa to distributional patterns of co-occurring plant species on the Idaho National Engineering Laboratory in southeastern Idaho. At each of these areas, on the INEL where the two subspecies co-occur, vegetative cover was estimated by point interception, species association was tested with a plotless method, soils were described and samples collected for laboratory analyses, and sagebrush water stress was measured on both subspecies. Vegetation pattern analysis was performed with Reciprocal Averaging ordination. The results of vegetation pattern analysis for one of the study areas are discussed and indicate that a sand gradient exists that corresponds with the distributions of the two sagebrush subspecies. Preliminary data indicated that diurnal water stress patterns for the two subspecies were similar during June. Predawn measurements of sagebrush water stress also do not differ significantly for the two sagebrush subspecies.

3312 (DOE/ID—12098, pp 198-201) **Evaluating the effects of a prescribed burn on the foraging ecology of sage and Brewer's sparrows.** Winter, B.M.; Best, L.B. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

The effects of a prescribed burn on the foraging ecology of the Brewer's sparrow (Spizella breweri) and sage sparrow (Amphispiza belli) will be studied. Foraging patterns, feeding behavior, and feedig frequency of adults during the nestling period will be documented for pre- and post-burn conditions. Details of the field methodology are discussed.

3313 (DOE/ID—12098, pp 202-210) **Effects of prescribed burning on nongame birds breeding in sagebrush communities - pre-burn phase.** Petersen, K.L.; Best, L.B. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

In 1980 and 1981, the breeding ecology of nongame birds inhabiting a sagebrush (Artemisia spp.) - dominated community in southeastern Idaho was studied. The bird community was comprised primarily of sage sparrows (Amphispiza belli) and Brewer's sparrows (Spizella breweri); only three other nongame species nested on the study area. Most male sage sparrows present in 1980 returned in 1981. Sage sparrow territories were contiguous and averaged 0.75 ha. Brewer's sparrow territories were not contiguous and averaged 0.75 ha. Brewer's sparrow territories were not contiguous and averaged 0.51 ha. Most males of all species acquired mates. Nesting success was very high (70 to 90%) in 1980, but decreased to 40 to 60% in 1981. Brewer's sparrows nested in areas with relatively large, dense sagebrush and low herbaceous plant coverage; sage sparrows preferred areas with clumped sagebrush. The two sparrow species chose similar nesting substrates, preferring relatively large, living shrubs. Nestling diet was entirely Arthropodan, but adult diets have yet to be analyzed. After eliminating sagebrush by prescribed burning, population densities of sparrows and sage thrashers (Oreoscoptes montanus) likely will decrease, but those of species more characteristic of grasslands probably will increase.

3314 (DOE/ID—12098, pp 211-219) **Effects of a controlled fire on small rodent populations in a sagebrush community.** Keller, B.L.; Groves, C.R.; Loven, J.S. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

An investigation of species composition, food habits, and movement patterns of rodent populations on a prescribed burn area was initiated at the Idaho National Engineering Laboratory in June 1981. Live- and snap-trap data collected prior to the burn indicated that the small mammal community was composed of deer mice (Peromyscus maniculatus), least chipmunks (Eutamias minimus), Townsend's ground squirrels (Spermophilus townsendii), Great Basin pocket mice (Perognathus parvus), Northern grasshopper mice (Onychomys leucogaster), Ord's kangaroo rats (Dipodomys ordii), and montane voles (Microtus montanus) in decreasing order of abundance. Changes in food habits, as assessed from stomach contents of snap-trapped individuals, and the movement-colonization pattern as it relates to feeding strategies of rodents will be compared for both pre- and post-burn residents occurring in control and experimental areas.

3315 (DOE/ID—12098, pp 220-235) **Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory.** Gates, R.J.; Eng, R.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study was begun in May 1980 to determine the abundance, distribution, and food habits of sage grouse (Centrocerus urophasianus), pronghorn (Antilocapra americana), and lagomorphs on a sagebrush (Artemisia tridentata) grassland burn site on the Idaho National Engineering Laboratory (INEL). The burn site was treated in August and October 1981 and in September 1982. Post burn data were collected after treatment to document short term effects of fire on sage grouse and lagomorphs. (JMT)

3316 (DOE/ID—12098, pp 236-239) **Insects associated with sagebrush communities at the Idaho National Engineering Laboratory.** Stafford, M.P.; Barr, W.F. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study was initiated in May 1981 on a proposed burn site near Howe, Idaho to document the taxonomic composition of the insect community and determine the ecological role and seasonal occurrence of insects associated with Artemisia tridentata communities. Collection methods included windowpane traps, Malaise traps, pitfall traps, black light traps, Berlese funnels and sweepnetting vegetation and resulted in 229 collections comprising nearly 40,000 specimens. Results from 1981 are incomplete but preliminary

counts show that approximately 150 families representing 14 orders were collected on the study area.

3317 (DOE/ID—12098, pp 240-249) **Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory.** Cole, N.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Water potential of dominant shrubs and perennial grasses and soil moisture content on the Idaho National Engineering Laboratory prescribed burn study area were measured during the summer of 1981. Plant and soil moisture estimates were comparable for control and potential burn plots. Soil moisture ranged from 12% to nearly 18% of dry soil weight in early June and from 7% to 11% by mid July. Data from replicate samples show that a sample size of approximately 25 is required to sample soil moisture to within 10% of the mean with 95% confidence. Diurnal patterns of water potential for big sagebrush (Artemisia tridentata) and green rabbitbrush (Chrysothamnus viscidiflorus) were similar. Water potential decreased from predawn levels throughout the morning and early afternoon, reaching minimum values during mid afternoon. Midday and predawn water potentials became increasingly lower as the season progressed. Diurnal and seasonal patterns for big sagebrush and green rabbitbrush water potentials were generally consistent with those published for Great Basin shrubs. By mid July, midday water potential of giant wildrye (Elymus cinereus) was below -4.0 MPa. Diurnal fluctuations of water potential in giant wildrye were 2.3 MPa, which is greater than that of the shrubs of typical values found in the literature for grasses. Because the area that burned most thoroughly under prescription in August 1981 was a stand of giant wildrye, studies during the summer of 1982 will focus on that species. Effects of fire on growth and development, water relations, and gaseous exchange will be examined.

3318 (DOE/ID—12098, pp 250-263) **Relationships of black-tailed jack rabbit diets to vegetal composition of habitats.** Johnson, R.D.; Anderson, J.E. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Diets, densities, and habitats of black-tailed jack rabbits (Lepus californicus) were examined on the Idaho National Engineering Laboratory (INEL) during the summer of 1980. Spotlight censusing showed that jack rabbit densities were consistently higher in some habitats than others. From these data, 11 study sites were chosen, representing a range of rabbit densities and a variety of vegetation types. Sixty-six plant species were identified in the habitats, including 11 grasses, 7 shrubs, and 48 forbs. Analysis of fecal pellets showed that black-tailed jack rabbits ate a wide variety of plants. Forty-three taxa of plants were identified, including 11 grasses, 7 shrubs, and 25 forbs. Grasses, including Agropyron spp., Elymus spp., Sitanion hystrix, Stipa comata, and Oryzopsis hymenoides, were the most preferred food, comprising over 65% of the diet in nine sites. At two sites, winterfat (Ceratoides lanata) comprised the largest proportion of the diet. There was significantly greater similarity among diets than among vegetal compositions of the sites, suggesting that jack rabbits feed selectively. Jack rabbit densities were higher in areas having higher proportions of grass cover. Similarity between diet and habitat composition was positively correlated with Jack rabbit density and with the amount of grass cover in the habitats. Jack rabbits tend to select grass-dominated areas for feeding at night; this provides easy access to preferred foods and may conserve energy.

3319 (DOE/ID—12098, pp 264-267) **Coyote-leporid relations on the Idaho National Engineering Laboratory.** MacCracken, J.G.; Hansen, R.M. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

The study presented follows previous studies that have examined coyote (Canis latrans) food habits and abunance in relation to leporid populations on the Idaho Natioanl Engineering Laboratory (INEL). Results of data collected during September 1981 indicate that coyotes have increased consumption of blacktail jack rabbits (Lepus californicus) in response to the recent increase in black-tail jack rabbit populations on the INEL. These results support some predictions of optimal foraging theory concerning coyote food selection in relation to leporid abundance.

3320 (DOE/ID—12098, pp 268-277) **Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory.** Stoddart, L.C. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Starting in 1975, spring and fall density indices of coyotes (Canis latrans), black-tailed jack rabbits (Lepus californicus), two species of rabbits (Sylvilaqus nutallii and S. idahoensis) and several species of rodents have been obtained for the eastern half of the INEL. The purpose has been to measure the pattern and interrelationships of density change among these predator and prey species. Relative abundance of coyotes, measured by a combination of three independent index procedures, (trap line, scat line, and scent station line) increased 3-fold from 1975 to 1981. Over the same period, jack rabbit density, estimated from flushing-transect counts, increased from 2 to 189 jack rabbits per $km^2$ in 1980 then declined 18% in 1981. Flushing-transect density estimates of the two Sylvilagus species combined increased from 27 rabbits per $km^2$ in 1979 to 45 rabbits per $km^2$ in 1981. 1975 to 1978 density indices of each of the five most commonly captured rodent species showed short term changes of about 3-fold. In 1980 and 1981 indices of the rodent species (with one exception) showed marked increases of about three times previous observed highs. During spring and fall 1981, 400 jack rabbits were collected on the INEL to provide jack rabbit demographic information. Breeding was synchronous with four littering periods. Average production of young per adult female surviving the breeding season was 11.5. Juveniles sustained a 92% mortality rate from birth to October. Over-summer adult jack rabbit mortality was 69%.

3321 (DOE/ID—12098, pp 287-296.A) **Impacts of jack rabbit herbivory on sagebrush steppe vegetation.** Anderson, J.E.; Johnson, R.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

The vegetation studies that have been initiated on the Idaho National Engineering Laboratory (INEL) to assess the impacts of a peak in the black-tailed jack rabbit (Lepus californicus) population cycle on range vegetation are described. The results of censuses of the jack rabbit population from 1979 to present are also discussed. During the summer of 1979, two clusters of exclosure plots were established on the INEL. Each cluster consists of six exclosure plots paired with six plots that are open to jack rabbit herbivory. The clusters were located in two contrasting vegetation types, but both areas were chosen to assess the impacts of jack rabbits on preferred foods. In 1979, there was no significant difference in total vegetal cover or cover of dominant species between exclosed and open plots in either cluster. Vegetal data from these permanent plots will be collected again in 1982. Since January 1980, nighttime jack rabbit counts, made by spotlighting, were conducted quarterly along three paved highway routes and occasionally along backroads routes. Estimates of black-tailed jack rabbit densities from the backroad counts were usually much higher than those from paved road counts. The average density for a 45-km backroads route in May of 1981 was 2.6 jack rabbits/ha. The highest densities of jack rabbits were observed in grass-dominated habitats on the northern portion of the Site. The same general areas received heavy rabbit use from May 1980, through May 1981, but by September 1981, the distribution of jack rabbits along the 45-km backroads route had changed markedly.

3322 (DOE/ID—12098, pp 297-302) **Long-term studies of relative density of rodents on the Idaho National Engineering Laboratory.** Keller, B.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A long-term study of the relative density of 5 rodent communities was initiated during fall and spring periods beginning September, 1980 at the Idaho National Engineering Laboratory. Mean rodent numbers, as determined by snap trapping, declined from

207.2 to 78.4 individuals per 1000 trap nights on 4 of 5 independent study areas over a 2 1/2 year period. However, density appeared to be increasing on all 5 study areas based upon samples collected during September, 1982. Diversity varied among sampling sites but remained most extensive at a localty near the Radioactive Waste Management Complex on the Idaho National Engineering Laboratory.

3323 (DOE/ID—12098, pp 303-308) **Ecological study of the American rough-legged hawk on the Idaho National Engineering Laboratory.** Watson, J.W.; Eng, R.L. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study was initiated in January 1982 on the Idaho National Engineering Laboratory Site to investigate the winter ecology of the American rough-legged hawk (Buteo lagopus). Seven hawks were trapped and wing-marked between the Central Facilities Area and the Test Area North along Lincoln Boulevard. One marked hawk occupied a 1.3 $km^2$ range for several weeks and exhibited conspecific territorial defense. Changes in rough-legged hawk density and food habits appeared related to snow cover. Future radiotracking and data collection will continue through March 1983.

3324 (DOE/ID—12098, pp 309-315) **Raptor studies on the Idaho National Engineering Laboratory.** Craig, T.H.; Craig, E.H.; Powers, L.R. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study of wintering and nesting raptors is being conducted on the Idaho National Engineering Laboratory (INEL) during 1981-1982 at a time when black-tailed jack rabbits (Lepus californicus) are numerous. Baseline data on raptors which inhabited the study area were collected in a previous study from 1974 through 1976 at a time when jack rabbits were scarce, and comparisons in raptor densities will be made between the two studies. In addition, information will also be collected on home range size of long-eared owls (Asio otus) in the vicinity of nuclear facilities. A nesting census, collection of productivity data on nesting raptors and the long-eared owl study will begin in Spring 1982. Preliminary data from a car survey of non-breeding raptors in 1981-1982 indicate a much higher population of large raptors on the INEL than in 1974-1976 and suggest that the large black-tailed jack rabbit populations may be responsible.

3325 (DOE/ID—12098, pp 347-356) **Sage grouse on the Idaho National Environmental Research Park.** Connelly, J.W.; Ball, I.J. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A comprehensive study of sage grouse (Centrocercus urophasianus) ecology was conducted on the Idaho National Engineering Laboratory (INEL) site between June 1977 and May 1981. Sage grouse used lawns surrounding INEL facilities for feeding and loafing throughout the summer. Mean summer home range was 406 ha for adult female sage grouse and 94 ha for juveniles. Radionuclide concentrations in grouse summering near a liquid radioactive waste disposal area (N = 29) were significantly higher than those in grouse summering near a solid radioactive waste disposal area (N = 14) or control areas (N = 20). Sage grouse moved from 2 to 83 km during seasonal migration. Fall movements from INEL facilities to winter range were slow and meandering. Spring movements of females from leks to summer range were also slow and meandering but male movements appeared rapid and direct. Sage grouse remained in segregated flocks during early summer but the number of mixed sex flocks increased in late summer. Sage grouse occurred in segregated flocks throughout the winter. Both flock type and habitat influenced winter sage grouse flock size. Mean flock size remained relatively constant as winter weather became more severe. Agricultural aras were an important component of sage grouse summer range and were preferred by all sage grouse sex and age classes. Sage grouse winter range was generally characterized by sagebrush stands with 11 to 30% canopy coverage.

### 5106 Regulations

3326 (DOE/EP—0058/1) **Environmental compliance guide: guidance manual for Department of Energy compliance with the Endangered Species Act.** (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Environmental Compliance). Jun 1982. 68p. NTIS, PC A04/MF A01. Order Number DE84002752.

Portions are illegible in microfiche products. Original copy available until stock is exhausted.

This document provides guidance for Department of Energy (DOE) officials responsible for complying with Section 7 of the Endangered Species Act of 1973, as amended. The Endangered Species Act requires federal agencies such as DOE to ensure that none of their actions jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitat for such species. The Department is required to consult with the US Fish and Wildlife Service and/or the National Marine Fisheries Service, and if advised by these agencies that an endangered or threatened species or critical habitat may be affected, prepare a biological assessment of the effects of the proposed action. The content of a biological assessment is based on existing information on the federally protected species and habitats, data and observations from limited site surveys or visits, and consultations with local experts on the species. Information in the biological assessment is used by the responsible agencies as a basis for evaluating the effects of the proposed DOE action on species federally protected.

## 52 ENVIRONMENTAL SCIENCES, AQUATIC

### 5201 Basic Studies

3327 (AD-A—131129/9) **Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82.** Guswa, J.H.; Lyman, W.J.; Adams, J.; Bass, J.; Brecher, A. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Jun 1983. 325p. (ADL—88100-00-VOL-2). NTIS, PC A14/MF A01.

This technical report documents an overview of groundwater hydrology and a current technology review of equipment, methods, and techniques used in groundwater field investigations. Numerous topics applicable to the planning, scheduling, data collection, and integration steps essential in a comprehensive field program are addressed. The report, targeted for installation engineers and managers responsible for evaluation of or response to suspected instances of groundwater contamination, consists of two volumes. Volume II: Desk Reference. A comprehensive survey of technical works resulted in this compilation of groundwater fundamentals and field investigation activities. Topical coverage ranges from hydrology basics to state-of-the-art equipment and field methods. Sufficient material is presented to acquaint the reader with basic concepts and fundamentals of groundwater and water quality issues. Numerous illustrations highlight these items. An applications-oriented review of field methods identifies equipment types and limitations. The essentials of geophysics, drilling methods, well construction, and sampling are addressed, with emphasis on integrating information in an iterative process to devise a cost-effective program. A review of contaminant transport in groundwater identifies significant parameters and physical systems of concern. Finally, a summary of groundwater treatment methods provides an options list for potential use. The report concludes with an agency address directory for water quality information and some representative cost schedules for field activities.

3328 **Animal $^{13}C/^{12}C$ correlates with trophic level in pelagic food webs.** Rau, G.H.; Mearns, A.J.; Young, D.R.; Olson, R.J.; Schafer, H.A.; Kaplan, I.R. (Univ. of California, Los Angeles). *Ecology;* **64**: No. 5, 1314-1317(1983).

Whatever the underlying cause(s), our observations further substantiate the existence of small but progressive increases in

animal tissue $^{13}C/^{12}C$ with increasing trophic level. Such a relationship has significant implications for the use of stable carbon isotope natural abundance in animal tissues or remains, in order to interpret the tropic structure and food base of past as well as present-day animal communities. The $\delta^{13}C$ of the marine animal tissues analyzed ranged from -20.6 to -15.8‰. The macro-fauna from the eastern tropical Pacific Ocean had higher isotope values than the net plankton collected from the same area. The average increases in $\delta^{13}C$ per trophic level were 0.73 and 1.38‰ for the California coastal waters and for the eastern tropical Pacific, respectively. These isotopic increases approximate closely those previously reported to occur within single trophic level steps.

3329 **Effects of differential growth and mortality in the seasonal succession of phytoplankton populations in Lawrence Lake, Michigan.** Crumpton, W.G.; Wetzel, R.G. (Michigan State Univ., Hickory Corners). *Ecology;* **63**: No. 6, 1729-1739(Dec 1982). Contract AC02-76EV01599.

An investigation was made of factors controlling algal succession in a small, oligotrophic lake during summer stratification. Phytoplankton population densities, growth rates, sedimentation losses, and mortality due to zooplankton grazing were measured weekly. Cyclotella michiganiana was the dominant alga through the end of June, at which time Cyclotella comensis began to increase, becoming the dominant by August. In August, high grazing pressure caused the rapid declines of both C. michiganiana and C. comensis, which were followed by an increase of Sphaerocystis schroeteri. The combined effect of greater growth rates and lower loss rates of C. comensis resulted in its dominance over C. michiganiana. In contrast, the C. comensis-S. schroeteri succession clearly resulted from differential mortality alone. It is likely that losses due to sedimentation and/or grazing are important in many lakes and that interspecific competition may be less important in actually controlling seasonal succession.

3330 **Nutrient spiralling in streams: implications for nutrient limitation and invertebrate activity.** Newbold, J.D.; O'Neill, R.V.; Elwood, J.W.; Van Winkle, W. (Oak Ridge National Lab., TN). *American Naturalist;* **120**: No. 5, 628-648(Nov 1982). Contract W-7405-ENG-26.

Nutrient cycling in streams occurs in conjunction with downstream transport as spatially distributed process that has been termed spiralling. The intensity of reutilization of nutrients as they pass downstream can be quantified in terms of the length of stream required for a nutrient atom to complete one (abstract) cycle; this distance is termed the spiralling length. The model for steady-state spiralling of a limiting nutrient predicts that most of the downstream transport of nutrient occurs in particulate or unavailable form when nutrient limitation is severe; in this case, transportability of particulates is a major determinant of spiralling length. On the other hand, when nutrient limitation is moderated by density-dependent mechanisms, transport in the dissolved phase dominates, and transportability of particles has little influence on spiralling length. The potential role of invertebrate consumers in controlling spiralling was investigated by considering their influence on regeneration, transportability, and uptake of nutrients. Functional processes of grazing and filter feeding appear most likely to shorten spiralling length when nutrient limitation is severe, while the process of shredding is more likely to shorten spiralling length when nutrient limitation is weak. In some cases there may be levels of consumer activity at which spiralling length is minimized.

## 5202 Chemicals Monitoring And Transport

*REFER ALSO TO CITATION(S) 1800, 1803, 2972, 3321, 3381, 3419*

3331 **(CONF-8310206—1) Characterization of water quality for regional planning.** Hunsaker, C.T.; Beauchamp, J.J. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE84001961.

From Water Pollution Control Federation annual conference; Atlanta, GA, USA (2 Oct 1983).

Water quality is often characterized for regional planning and various techniques have been used. A confounding factor for water quality at the regional scale is that three separate systems for classifying watersheds or hydrologic regions exist, and the boundaries for hydrologic regions do not always agree between these systems. This paper uses the USGS hydrologic unit system's division of water accounting and cataloging units. Water quality data aggregated at the county level are useful for some planning purposes; however, this aggregation forces hydrologic data into arbitrary political boundaries and may not result in an accurate characterization of water quality. Because hydrologic units are geographical areas based on river or stream basins, a more realistic way to characterize water quality on a regional scale may be to partition data by the various levels of the hydrologic unit. This paper discusses the strengths and weaknesses of various methods that can be used to characterize water quality for regional studies and reports the results from some preliminary work using two techniques - cluster analysis and discriminant analysis - to determine the most appropriate method for such characterization. 13 references, 3 figures.

3332 **(SNV-PM—1631) Systems for testing and hazard evaluation of chemicals in the aquatic environment - ESTHER. A background paper and a programme outline as a basis for the research plan in preparation.** Landner, L. (and others). (Statens Naturvaardsverk, Solna (Sweden)). Dec 1982. 82p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751417.

This document presents the scope and the objectives of a new Project Area, launched by the Research Committee of the National Swedish Environment Protection Board. It also discusses the rational and the needs for testing and hazard evaluation of chemicals and of industrial effluents. The main part of the document is a presentation of the state of the art in the field of testing and hazard evaluation of chemicals in relation to the aquatic environment. The hazard of a chemical or of an industrial effluent is a function of two broad considerations, the potential of the chemical or the effluent to harm biological systems and its potential for exposure so that harm of damage can occur. A chemical to which no exposure occurs cannot be considered a hazard. This means that the exposure analysis - or the study of chemical fate - is a necessary and fundamental part of any hazard assessment procedure, which must be carried out in a step-wise manner. In the study of potential biological effects of a chemical, a major problem is the extrapolation or interpretation of the experimental results in terms of potential harm to the natural ecosystem. In order to improve our possibilities to deal with this problem, we need a better understanding of the characteristics of relevant ecosystems. The document ends by a preliminary outline fo a research programme, based on the review and the indentified gaps in our kowledge. This outline is now being worked out in more detail, and will shortly result in a research plan for the Project Area.

## 5203 Radioactive Materials Monitoring And Transport

*REFER ALSO TO CITATION(S) 1912, 1974, 2016, 2018, 2019, 2020, 2021, 2022, 2029, 3274, 3296, 3300*

3333 **(AD-A—131425/1) Nuclear warfare water contamination. Technical report.** Phillips, J.C.; Roberts, J.A.; Sievers, R.H.; Gminder, R. (Science Applications, Inc., Schaumburg, IL (USA)). 1 May 1982. 218p. NTIS, PC A10/MF A01.

The fallout contamination of watersheds and water supplies resulting from surface burst nuclear weapons is sufficiently high to require the use of water purification equipment to produce potable water that meets the current radiological water quality standards. Problems with existing radiation detection and monitoring equipment are discussed. A water contamination model is described.

3334 (DOE/ID—12098, pp 83-88) **Iodine-129 in muscle of waterfowl using the test reactor area radioactive leaching ponds in southeastern Idaho.** Halford, D.K.; Markham, O.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Waterfowl were collected at the Test Reactor Area (TRA) radioactive leaching pond, and TRA sewage lagoon on the Idaho National Engineering Laboratory Site and nearby control areas to

determine $^{129}I/^{127}I$ atom ratios in muscle tissue. Iodine-129/127 atom ratios in muscle tissue ranged from $1.5 \times 10^{-7}$ to $3.8 \times 10^{-6}$ and averaged about $1.6 \times 10^{-6}$ for waterfowl from the TRA pond; $2.8 \times 10^{-7}$ to $4.6 \times 10^{-6}$ and averaged $1.6 \times 10^{-6}$ for waterfowl from the TRA sewage pond, and; $4.6 \times 10^{-7}$ to $3.1 \times 10^{-6}$ and averaged $1.3 \times 10^{-6}$ for control samples. Iodine-129/127 atom ratios were statistically higher (P 0.05) for a group of commercially raised ducks placed on the ponds for experimental purposes. Internal wholebody dose to waterfowl from $^{129}I$ was estimated to be $1.0 \times 10^{-5}$ mrad for waterfowl from control areas and $3.0 \times 10^{-5}$ mrad for TRA pond waterfowl. The thyroid dose commitment to man consuming a duck from the TRA ponds was $1.0 \times 10^{-4}$ mrem. Liquid effluents from the TRA radioactive leaching ponds do not appear to cause an appreciable increase in $^{129}I/^{127}I$ atom ratios in tissues of waterfowl using the ponds.

3335 (DOE/ID—12098, pp 357-380) **Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds.** Kuzo, G.B.; Fraley, L. Jr.; Whicker, F.W.; Markham, O.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Concentrations of $^{239}Pu$, $^{239,240}Pu$, $^{241}Am$, $^{242}Cm$, and $^{244}Cm$ were studied in both abiotic and biotic matrices of test reactor leaching ponds located on the Idaho National Engineering Laboratory. Input of low-level liquid radioactive wastes to these leaching ponds has resulted in elevated concentrations of these nuclides in ecosystem components. Highest concentrations of nuclides were recorded in seston and periphyton with lowest concentrations in filtered water. Significant differences in concentrations were observed among components and also through a 52 day sampling period for each component. No consistently significant correlations relating component concentrations through time with changing limnological characteristics were found. Concentration ratios (CR's) for each nuclide differed among components. Highest CR's were calculated for the seston and periphytic matrices ($10^4$ to $10^5$) and lowest values for sediments ($10^2$ to $10^3$). Concentration ratios were similar for the phytoplankton and zooplankton components ($10^4$). Within each component, plutonium isotopes had consistently higher CR's than americium and curium nuclides. Intra-element differences were observed between the isotopes of plutonium and also the isotopes of curium. Inventories in the pelagic environs were in the MBq ($\mu$ Ci) range for all nuclides. Although transuranium inventories in waste water input to the ponds were greatly reduced during the 52 day study, inventories in the pelagic environs did not decrease as expected.

3336 (DOE/ID—12098, pp 381-398) **Uptake of $\gamma$-emitting radionuclides by soils placed in test reactor leaching ponds.** Kuzo, G.B.; Markham, O.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Uptake of 11 $\gamma$-emitting nuclides by two soil size fractions, $X < 45$ $\mu$m and $75 < X < 180$ $\mu$m, placed in water permeable containers and suspended in reactor leaching ponds was determined. Using least-square regression analyses, curves were fitted to a polynomial model and uptake rates were determined for the nuclides in each soil size fraction. Excluding $^{40}K$, soil nuclide concentrations continually increased during the 15 d study. For $^{54}Mn$, $^{60}Co$, $^{95}Zr$, $^{95}Nb$, and $^{144}Ce$ nuclides, uptake rate estimates were significantly ($P \leqq 0.05$) higher in the smaller diameter soil size fraction. Individual nuclide uptake rates were constant throughout the study for $^{51}Cr$, $^{54}Mn$, $^{60}Co$, $^{95}Zr$, $^{95}Nb$, $^{134}Cs$, and $^{144}Ce$. For $^{131}I$ and $^{141}Ce$ nuclides, nuclide accumulation rates were constant from approximately 1 to 50 h and then decreased for the remainder of the experiment. Uptake rates were positively correlated ($P \leqq 0.05$) with nuclide concentrations in filtered water and/or seston.

3337 (DOE/ID—12098, pp 399-402) **Effect of cooking on radionuclide concentrations in waterfowl tissues.** Halford, D.K. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Twenty-four commercially raised mallar ducks (Anas platyrhyncos) were released at the Test Reactor Area radioactive leaching ponds, and subsequently collected 56 to 188 days later. Liver, gizzard, and carcass were analyzed for radionuclide concentrations before and after cooking. Significant decreases ($P < 0.05$) in $^{137}Cs$, $^{134}Cs$, $^{60}Co$, $^{140}La$ and /sup 110m/Ag concentrations in carcass and liver samples occurred after cooking. Radionuclide concentrations in gizzard showed no significant change in radionuclide concentrations after cooking. Cesium-134 and $^{137}Cs$ concentrations decreased by 27% in carcass after cooking and reduced the dose commitment to man by that amount.

3338 (DOE/ID—12098, pp 403-408) **Residence time, dispersal, and harvest of waterfowl using a radioactive leaching pond in southeastern Idaho.** Browers, H.W. Jr.; Flake, L.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study was initiated in the fall of 1980 to determine residence times, dispersal, and harvest of waterfowl using the Test Reactor Area (TRA) radioactive leaching pond complex on the Idaho National Engineering Laboratory (INEL) site. Attempts were made to capture and band waterfowl using the ponds during migration. Three common goldeneyes (Bucephala clangula) and six mallards (Anas platyrynchos) were captured in the fall of 1980. Three mallards were also captured in the fall of 1981. Two bands have been recovered to date. In addition, daily observations were made from August to December 1980 and from October to December 1981 and the number and species of waterfowl were recorded. As of December 15, 1981, 665 waterfowl representing 14 species had been observed. However,the total number of waterfowl observed does not represent an accurate census due to recounts of some individuals.

3339 (PB—83-246983) **Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area.** Mitsch, B.F. (North Carolina Univ., Chapel Hill (USA). Dept. of Environmental Sciences and Engineering). 1982. 118p. NTIS, PC A06/MF A01.

Samples of water from wells located near a phosphate mining and manufacturing facility were collected and analyzed for Radium-226 and Radon-222. Chemical separation and emanation techniques were utilized in the analyses. Results indicated that mining and manufacturing were not having a detrimental effect on the radionuclide concentrations in the ground water of the area. Natural hydrogelogic factors can account for the differences in radioactivity observed in the various aquifers sampled. Wells sampled repetitively over time did not exhibit any significant changes in radium or radon concentrations. Baseline data were established which can be used to evaluate possible future impacts on radionuclide concentrations in ground water resulting from expansion of mining activities.

3340 **The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay.** Santschi, P.H.; Li, Y.; Adler, D.M.; Amdurer, M.; Bell, J.; Nyffeler, U.P. (Lamont-Doherty Geological Observatory of Columbia Univ., Palisades, NY). *Geochimica et Cosmochimica Acta;* **47**: No. 2, 201-210(Feb 1983). Contract AC02-76EV02185.

The relative mobility of nucides of Pb, Th, Pu, and Cs, which are widely used as geochemical tracers for sedimentation and bioturbation, was investigated in artificial microcosm tanks (MERL) and in Narragansett Bay. Their mobility was characterized by their removal rates from the water column, their affinity toward particles and their degree of penetration into the surface sediments. Pb, Th, and Pu transport was controlled predominantly by the affinity of these elements to particles, and the transport parameters of the particles themselves (i.e. sediment resuspension and mixing rates). Because of its low distribution coefficient, transport of Cs was controlled by molecular diffusion through pore water in the winter, while in summer, Cs transport was enhanced due to bioturbation. The increase with depth of the Cs/Pu ratio in core profiles of MERL and Narragansett Bay sediments is thus caused primarily by the higher mobility of Cs.

3341 **Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling.** Newbold, J.D.; Elwood, J.W.; O'Neill, R.V.; Sheldon, A.L. (Oak Ridge National Lab., TN). *Ecology;* **64**: No. 5, 1249-1265(1983). Contract W-7405-ENG-26.

To describe spiralling in Walker Branch, a first-order woodland stream in Tennessee, we released $^{32}PO_4$ to the stream water and measured its uptake from the water and then followed its dynamics in coarse particulate organic matter (CPOM), fine particulate organic matter (FPOM), aufwuchs, grazers, shredders, collectors, net-spinning filter feeders, and predators over a 6-week period. Rates of transfer among compartments and rates of downstream transport were estimated by fitting a partial differential equation model of the ecosystem to the data. With the resulting coefficients, the model was run to steady state to estimate standing stocks and fluxes of exchangeable phosphorus. Phosphorus moved downstream at an average velocity of 10.4 m/d, cycling once every 18.4 d. The average downstream distance associated with one cycle was therefore 190 m (10.4 m/d x 18.4 d). Spiralling length, at steady state, is approximately the ratio of the total downstream flux of phosphorus per unit width of stream (720 $mg.d^{-1}.m^{-1}$) to the rate of P uptake from the water (3.90 $mg.m^{-3}.d^{-1}$). CPOM accounted for 60% of the uptake, FPOM for 35%, and aufwuchs for 5%. Turnover times of P in particulates ranged from 5.6 to 6.7 d, except for FPOM, which showed a slower turnover time of 99 d. Of the P uptake from water by particulates, 2.8% was transferred to consumers, while the remainder returned directly to the water. About 30% of the consumer uptake, in turn, was transferred to predators. The small consumer turnover length reflected low consumer uptake of P from particulates and slow downstream drift velocity (0.013 m/d). In spite of the low rate of phosphorus uptake, the combined consumer-and-predator community accounted for 25% of the standing stock of exchangeable P in the stream. The retentiveness of this community is attributable both to the low drift rate and to a long turnover time (152 d) for P within the community.

### 5204 Thermal Effluents Monitoring And Transport

*REFER ALSO TO CITATION(S) 3336*

### 5205 Site Resource And Use Studies

*REFER ALSO TO CITATION(S) 2178, 2179*

3342 **(DPST—83-736-Vol.2) Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II.** Specht, W.L.; Painter, W.B. (Environmental and Chemical Sciences, Inc., Aiken, SC (USA)). Aug 1983. Contract AC09-76SR00001. 70p. (ECS-SR—3-Vol.2). NTIS, PC A04/MF A01. Order Number DE84001899.

A total of 131,815 macroinvertebrates were collected from meroplankton samples in the Savannah River and its tributary streams between 13 March and 29 August 1982. Fifty-three taxonomic groups, including 47 insect families and six non-insect taxa, were represented in the macroinvertebrate samples. Dipterans (true flies), particularly Chironomidae (midges) and Simuliidae (black flies) were the most abundant macroinvertebrate taxa at all transects. Other abundant taxa included Ephemeroptera (mayflies), Trichoptera (caddisflies), Amphipoda (scuds), Hydracarina (water mites) and nematode worms. When the invertebrate community was examined with respect to functional feeding groups, insect collectors were found to be the most abundant functional group. More invertebrate-taxa and higher densities of organisms were collected from the bottom drift samples than from the top of the water column, and more were collected from the center of the transects than from the bank areas. The results of the water quality analyses indicate that thermal discharges form Beaver Dam Creek, Four Mile Creek, and Pen Branch elevated the water temperature of the Savannah River approximately 1.6°C between river Transects 6 and 9.

3343 **(PB—83-249375) Survey of water quality and flow in Maryland coastal zone streams: a data report. Final report.** (Ecological Analysts, Inc., Sparks, MD (USA)). May 1983. 32p. NTIS, PC A03/MF A01.

Water quality data were collected weekly during March and April 1983 for 23 freshwater tributaries to the Chesapeake Bay as a pilot study in an assessment of the significance of acid deposition in Maryland. Parameters measured included pH, dissolved oxygen, specific conductance, alkalinity, dissolved aluminum, nitrate, sulfate, and stream flow. This report presents the data from that effort, without analysis or interpretation.

### 5206 Regulations

*REFER ALSO TO CITATION(S) 1799 3320*

## 53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

### 5301 Social And Economic Studies

3344 **(GAO/RCED—83-168) Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 1 Jun 1983. 21p. US General Accounting Office, Document Handling and Information Services Facility, PO Box 6015, Gaithersburg, MD 20760.

This report provides information on the racial and economic characteristics of communities surrounding four hazardous waste landfills in three southeastern States. It also describes Federal criteria for siting landfills and provides data on public participation and how the Environmental Protection Agency's (EPA's) proposed hazardous waste facility permit changes will affect it.

### 5303 Environmental Impact Statements

*REFER ALSO TO CITATION(S) 1900, 2038*

3345 **Lawrence Livermore National Laboratory and Sandia National Laboratories--Livermore sites, Livermore, California.** *EIS (Environmental Impact Statements);* **6**: No. 9, 22-23(Sep 1982).

Continued operation and expansion of facilities at the Lawrence Livermore and Sandia laboratories in Alameda County near Livermore, California is proposed. New construction and program activities are discussed. Positive and negative impacts are discussed.

## 55 BIOMEDICAL SCIENCES, BASIC STUDIES

### 5501 Behavioral Biology

*REFER ALSO TO CITATION(S) 3323*

3346 (DOE/ID—12098, pp 319-324) **Ecology of exploited and unexploited bobcat population in southeastern Idaho.** Knick, S.T.; Ball, I.J. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study of the population dynamics and social organization of bobcats (Felis rufus) on and adjacent to the Idaho National Engineering Laboratory (INEL) was initiated in January 1982. Fourteen bobcats (11 on the INEL and three in an offsite area) have been trapped, tagged, and radioinstrumented. Movement data on two female kittens from 20 January to 7 March indicate that they are independent of maternal care but still remain in February and March on the INEL study area averaged 2.31 jack rabbits (Lepus californicus)/km and 0.62 cottontail rabbits (Sylvilagus nuttallii)/

km. Blood samples were taken from each bobcat trapped; hematology and blood chemistry values are reported.

3347 (DOE/ID—12098, pp 325-337) **Sage grouse census methods and populations in southeastern Idaho.** Connelly, J.W.; Ball, I.J. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Sage grouse (Centrocercus urophasianus) population indices ad a recent population decline in southeastern Idaho are discussed. Lek surveys and censuses and summer brood counts can provide useful information on population trends. However, leks are dynamic with respect to changing habitats; therefore, breeding complexes should be defined and leks within each complex should be censused on the same day. Arrival of lone females on summer range may provide an early indication of productivity. Winter census routes are not reliable indicators of population change. A decline in the 1980 sage grouse population was characterized by lower mean brood size, a decline in the juvenile:female ratio, and an increase in females/km of summer routes. In 1981, the winter sex ratio (female:male) decreased, mean male attendance at leks declined, and the number of active leks in one portion of the study area decreased.

3348 (DOE/ID—12098, pp 338-346) **Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory.** Browers, H.W. Jr.; Flake, L.D. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

A study was initiated in July 1980 to investigate sage grouse (Centrocercus urophasianus) use of the Test Reactor area (TRA) during summer. Objectives include determination of habitat use, home range, activities, brood breakup, dispersal, and homing of sage grouse using the TRA. Juvenile and adult sage grouse were captured and radio-marked. Grouse fed at the TRA mostly in the mornings and evenings and generally spent the afternoons loafing in sagebrush (Artemisia spp.) habitat outside the facility. Brood breakup and fall dispersal data was gathered on two broods. Fall movements of five other juveniles and 10 adults were also documented. The study will be continued through 1982.

3349 **Robust analysis of aggregation error.** Gardner, R.H.; Cale, W.G.; O'Neill, R.V. (Oak Ridge National Lab., TN). *Ecology;* **63**: No. 6, 1771-1779(Dec 1982). Contract W-7405-ENG-26.

The complexity of ecological systems requires investigators to deal with aggregates: individuals aggregated into populations or populations aggregated into communities or trophic levels. A number of theoretical studies have indicated the dangers of dealing with the dynamics of aggregated systems. These studies have focused on mathematical models so the results have been of marginal interest to the field ecologist. The present paper develops practical criteria which can be applied when the underlying model is unknown or of little immediate interest. Our approach has been to examine 40 alternative models and to state conclusions that are valid, no matter what the underlying dynamics of the system. Theoretical studies indicate that no error is introduced when two components with identical turnover times are aggregated. This study shows that, for certain problems, the components can be aggregated with $<10\%$ error, even if the turnover rates differ by a factor of three. Criteria can be stated even more practically in terms of the ratio between the standing crops of the components. When measurement errors are considered explicitly, the criteria depend upon the accuracy with which aggregated and disaggregated measures can be estimated.

## 5502 Biochemistry

*REFER ALSO TO CITATION(S) 2933, 3386, 3411, 3422*

3350 **(DOE/ER/10581—T2) Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report.** Cashmore, A.R. (Rockefeller Univ., New York (USA)). 1983. Contract AC02-80ER10581. 22p. NTIS, PC A02/MF A01. Order Number DE84001273.

Portions are illegible in microfiche products.

cDNA clones from pea encoding the small subunit of RuBP carboxylase and the chlorophyll a/b binding protein were characterized by translation of hybrid-selected mRNAs. The translation products were identified by SDS-polyacrylamide gel electrophoresis and by in vitro chloroplast uptake and processing studies. These cDNAs were sequenced, providing for the first time the sequences of these photosynthetically important chloroplast polypeptides.

3351 **(DOE/NBM—4000571) CP/MAS $^{13}C$ NMR spectroscopic study of chlorophyll a in the solid state.** Brown, C.E.; Spencer, R.B.; Burger, V.T.; Katz, J.J. (Medical Coll. of Wisconsin, Milwaukee (USA); Nicolet Analytical Corp., Madison, WI (USA); Argonne National Lab., IL (USA)). Sep 1983. Contract W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01. Order Number DE84000571.

Solid-state cross-polarization, magic-angle sample spinning carbon-13 nuclear magnetic resonance spectra have been recorded on chlorophyll a- water aggregates, methyl pyrochlorophyllide a and methyl pyropheophorbide a (derivatives that lack a phytyl chain). Spectra have also been collected under a decoupling regime in which resonances of certain hydrogen-bearing carbon atoms are suppressed. These observations are used to assign the solid state spectra.

3352 **A fluorescent aminolipid from a green photosynthetic bacterium.** Olson, J.M. (Brookhaven National Lab., Upton, NY); Shaw, E.K.; Gaffney, J.S.; Scandella, C.J. *Biochemistry;* **22**: No. 8, 1819-1827(12 Apr 1983).

A preliminary chemical characterization is presented of phosphate-free aminolipids isolation from Chlorobium limicola f. thiosulfatophilum. The lipid contains no phosphorus, glycerol, sugar, ornithine, or lysine. Ultraviolet absorption and fluorescence spectra indicate that the amino moiety of the lipid is an aromatic heterocyclic compound. Infrared spectra indicate that the lipid is a secondary or tertiary amide, and gas chromatograhic analysis of the hydrolyzed lipid shows that for each 1100 g of lipid, 1 mol of myristic acid (C/sub 14:0/) is linked in an amide bond. Acid hydrolysis of the lipid yields two fluorescent substances, A (ninhydrine positive) and B (negative), in addition to myristic acid. Proton nuclear magnetic resonance (NMR) studies indicate that substance A contains a butyl groups attached to a conjugated ring carbon, two equivalent ethyl groups attached to one or two nitrogen atoms, and two downfield protons (8.4 ppm), perhaps attached to a ring carbon adjacent to a ring nitrogen as in adenine. Substance B also appears to contain a butyl group (not attached to a conjugated ring)as well as two vinyl protons (7.4 and 7.7 ppm) across a ring double bond. Chlorobium aminolipid appears to be a new type of lipid, enriched in membrane preparations from green sulfur bacteria. (JMT)

3353 **Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin.** Keniry, M.A.; Rothgeb, T.M.; Smith, R.L.; Gutowsky, H.S.; Oldfield, E. (Univ. of Illinois at Urbana-Champaign). *Biochemistry;* **22**: No. 8, 1917-1926(12 Apr 1983).

Deuterium ($^2H$) nuclear magnetic resonance (NMR) spectra and spin-lattice relaxation times ($T_1$) were obtained of L-[$\epsilon$-$^2H_3$]methionine, L-[$\epsilon$-$^2H_3$]methionine in a D,L lattice, and [S-methyl-$^2H_3$]methionine in the crystalline solid state, as a function of temperature, in addition to obtaining $^2H$ $T_1$ and line-width results as a function of temperature on [$\epsilon$-$^2H_3$]methionine-labeled sperm whale (Physeter catodon) myoglobins by using the method of magnetic ordering. Also recorded were $^{13}C$ cross-polarization "magic-

angle" sample-spinning NMR spectra of [$\epsilon$-$^{13}$C]methionine-labeled crystalline cyanoferrimyoglobin (at 37.7 MHz, corresponding to a magnetic field strength of 3.52 T) and of the same protein in aqueous solution. (JMT)

**3354 Histone fractionation by high-performance liquid chromatography.** Gurley, L.R.; Valdez, J.G.; Prentice, D.A.; Spall, W.D. (Los Alamos National Lab., New Mexico). *Analytical Biochemistry;* **129**: 132-144(1983).

A method for the rapid chromatography of histones by high-performance liquid chromatography (HPLC) using a reverse-phase $\mu$Bondapak $C_{18}$ column containing a packing of octadecylsilane chemically bonded to silica and a linear elution gradient running from water to acetonitrile is described. Two conditions were found to be necessary to achieve histone fractionation: (i) silylation of the active groups of the silica solid support, and (ii) trifluoroacetic acid (TFA) in the eluting solvents. Greater than 90% of the total [$^3$H]lysine-labeled protein applied to the column was eluted from the column. The fractionation of the histones appears to be based on the hydrophobic properties of the proteins. The HPLC histone fractions (identified by their electrophoretic mobilities) were eluted from the column in the following order: H1, H2B, (LHP)H2A, (MHP)H2A + H4, (LHP)H3, and (MHP)H3 (where LHP and MHP refer to the less hydrophobic and more hydrophobic histone variants). Phosphorylated histone species were not resolved from their unmodified parental species. The volatile nature of the water/acetonitrile/TFA eluting solvent facilitated the recovery of salt-free histones from the eluted HPLC fractions by simple lyophilization. This system is very useful for the rapid isolation of the lysine-rich histones, H1 and H2B, and the variants of histone H3. With further development, this system is expected to extend the advantages of HPLC to the fractionation of histone H4 and the variants of histone H2A as well.

## 5505 Metabolism

*REFER ALSO TO CITATION(S) 3036, 3046, 3350*

## 5506 Medicine

*REFER ALSO TO CITATION(S) 3039, 3041, 3390*

**3355 (CEA-BIB—237) Radiotherapy of acne - a literature survey.** Maximilien, R. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). 1983. 59p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704316.

This review is part of a feasibility study on a follow-up survey of patients having undergone dermatologic X-ray therapy. Its main purpose is to bring up to date the knowledge on the long-term effects of the radiotherapy of seborrheic diseases and to collect any historical data contributing to the interpretation of the results of a future survey in this field. The older and modern physiopathogenic ideas on acne are first stated, and both the radiological protocols and the therapeutic associations set forth by roentgenologists in the years 1930-1960 are then described. A dosimetric and health assessment is made and the modalities of an epidemiological survey are considered.

**3356 (CEA-CONF—6618) Preparation of carbon 11-labelled radiopharmaceuticals by the use of HPLC method.** Berget, G.; Maziere, M.; Godot, J.M.; Sastre, J.; Prenant, C.; Comar, D. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Jun 1982. 13p. (In French). (CONF-8206220—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704301.

From Meeting of HPLC and drugs analysis; Paris, France (8 Jun 1982).

Various medical examinations and metabolic studies are carried out with carbon 11-labelled radiopharmaceuticals. This radioelement offers a number of advantages: it can be introduced into an organic molecule without changing its properties; the radiation dose delivered to the patient is low (T = 20 mn); since the specific activity obtained is high (0.5 to 2 Ci/$\mu$ mole) the injected masses are very small; finally, tomographic images of the distribution of the product in the body may be obtained by the use of positron cameras. However in view of the radioactivities handled on a routine basis the preparations must be carried out without manual intervention, in closed shielded hoods. Synthesis methods and special equipment have been developed. In all cases the reaction mixtures are purified by HPLC, a method chosen for its speed, efficiency, ease of automation and adaptation to any product with a suitable choice of column and eluant. The radiopharmaceuticals are obtained in injectable solution (ethanol-physiological serum, buffered physiological serum) or in a mixture of volatile solvents which are evaporated by nitrogen bubbling and finally sterilised by passage over millipore filter. About ten different radiopharmaceuticals are prepared in this way in the laboratory.

**3357 (FRNC-TH—1115) Temporal functional analysis of dynamic scintigraphy by application of the Karhunen-Loeve transform.** Girardot-Verdenet, J. (Besancon Univ., 25 (France)). 1981. 113p. (In French). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704400.

Four main themes are dealt with in four different chapters. The first describes the scintigraphic data acquisition system: gamma camera and computer, as well as the various types of examination performed. Chapter two develops the subject of image processing techniques, especially as applied to kidney and heart scintigraphs which cover all problems encountered by doctors in the interpretation of a dynamic scintigraph. Chapter three is devoted to the formalism of Karhunen-Loeve transformation, the method best suited for data sorting because alone able to achieve a compression of this data in the sense of the mean quadratic error. The method is applied in chapter four to obtain functional heart and kidney images. The demarcation of the outlines of organs is often imprecise and two neighbouring zones developing at different rates have been differentiated by application of the Fukunaga-Koontz transformation which uses the properties of the Kahrunen-Loeve transformation in the case of heart scintigraphy where ventricles and auricles are superimposed. The aim of this work is to find out whether the compression of data for the Kahrunen-Loeve transformation provides any objective elements in the interpretation of dynamic scintigraphs.

**3358 (HRP—0905480/0) Radiation therapy plan for Regional Health Planning Council, Newark, New Jersey, 1980. New Jersey Health Service Area 2.** (Regional Health Planning Council, Newark, NJ (USA)). 1980. 14p. NTIS, PC A02/MF A01.

The purpose of this Plan is to implement one of the RHPC's legislative mandates: to regionalize health care services. The major objective of this Plan is to work toward the development of comprehensive cancer treatment programs, of which radiation therapy is one part. Such comprehensive programs should include chemotherapy, surgery, and supportive services such as a Tumor Conference Board, a Tumor Registery, treatment planning, rehabilitative services, and appropriate linkages to other programs in the area.

**3359 (INIS-mf—8262) Interference factors in digoxin analysis, especially in the serum of pregnant women, by RIA. Clinical aspects, methods, comparative studies using different RIA techniques.** Tratz, A. (Marburg Univ. (Germany, F.R.). Fachbereich Humanmedizin). 6 Feb 1981. 155p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83704401.

The causes of false digoxin concentrations measured in pregnant women by RIA were gone into; 103 sera of healthy women in their last trimester of pregnancy were analyzed by 4 different RIA methods. In 6 cases, falsepositive digoxin levels above 1.0 ng/ml were found; 4 of the measured digoxin levels were above 2.0 ng/ml, i.e. a clinically toxic concentration. No pseudodigoxin was detected post partum; however, the author was only able to make control measurements of 2 of the 3 positive sera between the 6th and 12th week post partum. The causes of this phenomenon remain unclear. It cannot be excluded that these pregnant women may have a still unknown hormone metabolite, resulting from a possible enzymatic defect, which cross-reacts with the digoxin antiserum and thus causes false-positive results. In those rare cases where pregnant women receive digitalis treatment, digoxin serum meas-

urements by RIA must be analyzed very critically due to the possibility of false-positive results. (orig.).

3360 **(INIS-mf—8269) Development of a radioimmunoassay of tetracycline and its derivatives.** Zitzewitz, A. von. (Hamburg Univ. (Germany, F.R.). Fachbereich Chemie). 27 Oct 1981. 242p. (In German). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83704396.

A radioimmunoassay for tetracycline was developed in the context of the present work. The determination of tetracycline content in biological samples is to be made valid using tetracycline RIA. As well as the carbodiimide method, a by radioimmunologists extremely seldomly used way involving a condensation reaction between protein and haptene via the Mannich reaction was successfully applied. Antibodies were produced using a conventional immunisation method after Abraham, the other applied alternative method after Vaitukaitis et al. The general working methods had to be adapted to the tetracycline RIA. All variable parameters of the antigen-antibody bond were tested to optimize the incubation conditions of the system as well as to control the tracer for a degradation. The detection limit of RIA is $10^{-12}$, the measuring range from $10^{-12}$ to $10^{-10}$ mol for tetracycline hydrochloride and rolitetracycline respectively and up to $10^{-9}$ mol for its derivates. The investigations for cross reactions showed a high specificity for tetracycline (100%) and its intravenously appliable pyrrolidino-methyl derivative rolitetracycline (88%). Standard curves could be drawn up using either of the two compounds tetracycline and rolitetracycline as standard. The pharmaco-kinetic behaviour of the parenteral administrable tetracycline was analyzed as example for the possible applications of the tetracycline radioimmunoassay. Parallel animal tests administring $^{3}H$ tetracycline hydrochloride were performed for radioimmunoassay reference. The possible application of tetracycline radioimmunoassay in food analysis is discussed. (orig./MG).

3361 **(INIS-mf—8270) Therapeutic effects of radiotherapy of carcinoma of corpus uteri and cervix in the years 1967-1972.** Lembong, J.T. (Duesseldorf Univ. (Germany, F.R.). Medizinische Fakultaet). 22 May 1980. 83p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83704402.

The results of radiotherapy of 374 cases of cancer of the cervix uteri, 163 cases of carcinoma of the endometrium, 24 cases of cancer of the cervical stump and 16 cases of sarcoma of the uterus carried out during the years 1967 to 1972 are shown. The absolute 5-year cure rates in our case material were 60,4 % for cancer of the cervix uteri and 73,0 % for carcinoma of the endometrium. In comparison with the treatment results reported in the years 1962 to 1966 an increase in radiotherapeutical efficiency was found, amounting to 8,8 % in case of cancer of the cervix uteri and 13,2 % in case of carcinoma of the endometrium. We also compared and analysed the different cure rates in case of primary irradiation (52,6 % resp. 55,8 %) as opposed to postoperative radiotherapy '76,9 % resp. 81,1 % cure rates). The frequency of radiation injuries and the rate of recurrence or metastases, as well as the incidence of concomitant diseases and complications have been reported and compared with those of other clinics.

3362 (INIS-mf—8475, pp 56-57) **Tomographic and scintigraphic examinations of the autologic spongiosa transplantat of the infective pseudoarthrosis.** Baars, H.G.; Weingaertner, R.; Wermann, H.; Woellenweber, H.D.; Klaua, M.; Mertens, E. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3363 (INIS-mf—8475, pp 58-59) **CT examination of the hip.** Meszaros, T.; Csobaly, S.; Cser, I. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3364 (INIS-mf—8475, pp 122-123) **Angiography of hormone producing tumours of pancreas.** Konya, A.; Engloner, L.; Vadon, G. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3365 (INIS-mf—8475, pp 176-177) **Application of contrast media in computer tomography.** Jend, H.H.; Heller, M.; Buecheler, E. 1982. (In Hungarian, German). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3366 (INIS-mf—8475, pp 178-179) **Computer tomography of abdominal tumours.** Kolesznyikova, E. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3367 (INIS-mf—8475, pp 182-183) **Double contrast method - why is it to be used only at every colon examination, and not at the stomach.** Varga, G.; Papp, Z.; Horvath, L.; Hiszek, V. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3368 (INIS-mf—8475, pp 210-211) **Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods.** Szilvasi, I.; Bor, K.; Bohar, L.; Kopcsanyi, Z.; Csakany, G. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3369 (INIS-mf—8475, pp 220-221) **Application of a dimeric contrast medium (Hexabrix) in angiography.** Monoki, E.; Pokorny, L.; Kelemen, J. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3370 (INIS-mf—8475, pp 160-161) **Noninvasive imaging of the abdominal aortic aneurysm.** Szilvasi, I.; Szebeni, A.; Csobaly, S.; Bohar, L.; Csakany, G. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3371 (INIS-mf—8475, pp 80-81) **Tangential moving (pendel) technique in postoperative irradiation of breast cancer.** Treer, T.; Mezoe, T.; Kelemen, J.; Esik, O. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

3372 (INIS-mf—8475, pp 82-83) **Physical investigation on the postoperative chest wall irradiation with tangential cobalt moving beam.** Kazai, L.; Toth, F. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3373 (INIS-mf—8475, pp 92-93) **Electron therapy of breast carcinoma. Pt. 1. Treatment planning.** Petranyi, J.; Reischl, G.; Pazonyi, B. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3374 (INIS-mf—8475, pp 96-97) **Electron beam therapy of breast carcinoma. Pt. 3. Early results.** Petranyi, J.; Toeroek, M.; Farkas, J. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3375 (INIS-mf—8475, pp 234-235) **Results of a pilot-study on neutron-therapy with 600 patients, a condensed report.** Eichhorn, H.J. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3376 (INIS-mf—8475, pp 244-245) **Localization technique applied for the combined radiation treatment of uterine cancer.** Topscher, Z.; Rasonyi, J. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3377 (INIS-mf—8475, pp 246-247) **Upper and lower half-body irradiation of patients with inoperable particellular bronchial carcinoma.** Huettner, J.; Eichhorn, H.J.; Dalluege, K.H. 1982. (In Hungarian, German). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3378 (INIS-mf—8475, pp 248-249) **Principles and performances of supralethal whole-body irradiation in case of bone-marrow transplantation of patients with acute leukemia.** Standke, E. 1982. (In Hungarian, German). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3379 (INIS-mf—8475, pp 264-265) **Source localization with semiconductor detector in the intracavitary therapy.** Hermann, A.; Simoncsics, L.; Polgar, I.; Zarand, P.; Nemeth, G. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).
From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).
Published in summary form only.

3380 **(INIS-mf—8548) Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium.** Fernsebner, M. (Wuerzburg Univ. (Germany, F.R.). Medizinische Fakultaet). 23 Feb 1981. 96p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703594.

It was the goal of this work to evaluate quantitatively the suitability of the radiation quality of tungsten, copper, titanium and scandium anodes for the generation of contrastful microradiographs and thus to increase the detection sensitivity of calcium. Halfwidth determinations were made with aluminium absorbers in air to characterize the different X-ray radiation qualities. Furthermore the dependence of the dose load of the absorber width and the type of the tube was determined in the radiation field for 20 kV anode voltage. Reference step-models were established in order to transfer these results to the calcium detection in microradiograph technology.

3381 (INIS-SU—179, pp 85-89) **Significance of determination of the efficient renal plasma circulation and glomerular filtration in evaluation of early changes of kidney functional state during "non-complicated" skeletal trauma in children.** Golovkin, S.I. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Radioisotope diagnosis in pediatrics and infantine surgery. Collection of scientific proceedings.

The functional state of kidneys in 79 children was evaluated from data of clinical-biochemical and isotope methods during different periods after skeletal trauma. Effective renal plasma circulation was determined by the method of single injection of hippuran. $^{125}$I at a dose of 7.4-14.8 kBq. Glomerular filtration was determined by the method of single injection of $^{131}$I with triambrin or $^{169}$Ysub(f) of DTPA without urine sampling. Disturbance of kidney functioning in 68.8 % of children with the trauma has been established.

3382 (INIS-SU—179, pp 90-96) **Significance of radioisotope and other investigational methods in definition of functional changes of different organs during some types of "non-complicated" skeletal trauma in children.** Golovkin, S.I.; Fokin, A.P.; Kuvshinov, Yu.A. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Radioisotope diagnosis in pediatrics and infantine surgery. Collection of scientific proceedings.

Results of examination of 232 children with different skeletal traumas have been analyzed. To elucidate pathogenesis of kidney complications, radioisotope renography using hippuran $^{128}$I at a dose of 7.4-14.8 kBq/kg was performed. Disturbance of kidney functioning in 69.7 % of cases has been revealed, expressiveness of pathology depending on trauma heaviness. The method of radioisotope renography is more sensitive as compared with biochemical tests. Revealed disturbances of kidney functioning, CNS, endocrinic system permit to consider them as manifestation of traumatic disease.

3383 **(PB—83-242412) In vivo imaging of the human thyroid with the Rutherford Positron Camera using (124)I.** Bateman, J.E.; Flesher, A.C.; Connolly, J.F.; Stephenson, R.; Fairweather, D.S. (Rutherford Appleton Lab., Chilton (UK)). [nd]. 43p. (RL—82-036). NTIS, PC E04/MF E04.

The Rutherford Multiwire Proportional Counter positron camera was used to form images of thyroids of seven patients, each of whom received 3.7MBq of 124 I produced in a cyclotron. Positron emission tomography scans produced between one and thirty-three hours after ingestion of the isotope all correlated well with clinical findings, ultrasonic examination and standard 99 Tc-pertechnate thyroid emission scans. The results showed great promise for further application of the positron camera to in vivo human imaging. More sophisticated software was being applied to improve the depth resolution. Camera hardware was being developed to improve the field of view, spatial resolution and sensitivity by factors of two or more to enable it to be used on any area of the body.

## 5507 Microbiology

*REFER ALSO TO CITATION(S) 2128*

3384 **(CEA-CONF—6607) Growth and physiology of an industrially useful macroalga (Chondrus crispus), analyzed by continuous measurement of gas exchange.** Brechignac, F.; Andre, M. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)). Nov 1982. 9p. (In French). (CONF-8211105—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704318.

From Bombannes VALVA symposium; Bordeaux, France (16 Nov 1982).

A system has been developed for the continuous measurement of gas exchanges in an aquatic environment containing a liquid phase and a $CO_2$-regulated gas phase, where the measurements take place. The method uses mass spectrometry and infrared analysis of $CO_2$, the system being piloted in real time by a computer. New data on the behaviour of the carbonate system of water in the presence of photosynthetic or respiratory activities are presented. Evidence is obtained in particular of a strong resistance to $CO_2$ diffusion and integration into the carbonate system in the replenishment of the $HCO_3^-$ pool depleted by photosynthesis. This must be accounted for when calculating the photosynthesis or $CO_2$ respiration rates. For the first time a photorespiration measurement is obtained on a macroalga by the $^{18}O$ technique. Finally the influence of environmental parameters on the physiology and growth of an industrially useful macroalga, Chondrus crispus, is discussed.

3385 **Adaptation of natural microbial communities to degradation of xenobiotic compounds: effects of concentration, exposure time, inoculum, and chemical structure.** Spain, U.C. (U.S. Environmental Protection Agency, Gulf Breeze, FL); Van Veld, P.A. *Applied and Environmental Microbiology;* **45**: No. 2, 428-435(Feb 1983).

Adaptation of microbial communities to faster degradation of xenobiotic compounds after exposure to the compound was studied in ecocores. Radiolabeled test compounds were added to cores that contained natural water and sediment. Adaptation was detected by comparing mineralization rates or disappearance of a parent compound in preexposed and unexposed cores. Microbial communities in preexposed cores from a number of freshwater sampling sites adapted to degrade p-nitrophenol faster; communities from estuarine or marine sites did not show any increase in rates of degradation as a result of preexposure. Adaptation was maximal after 2 weeks and was not detectable after 6 weeks. A threshold concentration of 10 ppb (10 ng/ml) was observed; below this concentration no adaptation was detected. With concentrations of 20 to 100 ppb (20 to 100 ng/ml), the biodegradation rates in preexposed cores were much higher than the rates in control cores and were proportional to the concentration of the test compound. In addition, trifluralin, 2,4-dichlorophenoxyacetic acid, and p-cresol were tested to determine whether preexposure affected subsequent biodegradation. Microbial communities did not adapt to trifluralin. Adaptation to 2,4-dichlorophenoxyacetic acid was similar to adaptation to nitrophenol. p-Cresol was mineralized rapidly in both preexposed and unexposed communities.

3386 **Legionella oakridgensis: unusual new species isolated from cooling tower water.** Orrison, L.H. (Centers for Disease Control, Atlanta, GA); Cherry, W.B.; Tyndall, R.L.; Fliermans, C.B.; Gough, S.B.; Lambert, M.A.; McDougal, L.K.; Bibb, W.F.; Brenner, D.J. *Applied and Environmental Microbiology;* **45**: No. 2, 536-545(Feb 1983). Contract W-7405-ENG-26.

A new species of Legionella represented by 10 strains isolated from industrial cooling towers is described. Legionella oakridgensis differed genetically from the other seven species of Legionella in DNA hybridization studies and differed serologically in direct fluorescent-antibody tests. The new species, unlike all other species except L. jordanis, did not require added L-cysteine for growth in serial transfer on charcoal-yeast extract agar. L. oakridgensis, as well as three other species tested, required L-cysteine for primary isolation from animal tissues. L. oakridgensis was the only species of Legionella that failed to produce alkaline phosphatase at pH 8.5. In all other respects, it resembled other species of Legionella, including having a high content of branched-chain cellular fatty acids and being pathogenic for guinea pigs. These bacteria have not yet been associated with human disease, but they are potential causes of legionellosis.

3387 **Effect of effluent from a nitrogen fertilizer factory and a pulp mill on the distribution and abundance of Aeromonas hydrophila in Albemarle Sound, North Carolina.** Hazen, T.C. (Univ. of Puerto Rico, Rio Piedras); Esch, G.W. *Applied and Environmental Microbiology;* **45**: No. 1, 31-42(Jan 1983).

The density of Aeromonas hydrophila, standard count bacteria, fecal coliform bacteria, and 18 physical and chemical parameters were measured simultaneously at six sites for 12 months in Albemarle Sound, N.C. One site was above and two sites were below the discharge plume of a Kraft pulping process paper mill. The fourth site was above and the remaining two sites were below the discharge point of a nitrogen fertilizer factory. The impact of the pulp mill on water quality was acute, whereas that of the nitrogen fertilizer factory was chronic and much more subtle. Diffusion chamber studies indicated that A. hydrophila survival is increased by pulp mill effluent and decreased by nitrogen fertilizer factor effluent. From correlation and regression analysis, A. hydrophila was found to be directly affected by phytoplankton density and, thus, indirectly by concentrations of phosphate, nitrate, and total organic carbon. These two point sources are suspect as indirect causes of red-sore disease epizootics, a disease of fish caused by A. hydrophila.

## 5508 Morphology

3388 **Low temperature tolerance and cold hardening of cacti.** Nobel, P.S. (University of California, Los Angeles). *Ecology;* **63**: No. 6, 1650-1656(Dec 1982). Contract AC03-76SF00012.

Reduced uptake by the chlorenchyma cells of cacti of a stain (neutral red) was used as an indicator of low-temperature damage resulting from cooling stems in the laboratory. Necrosis set in a few degrees below the temperature at which the fraction of cells accumulating stain was reduced by 50%. Coryphantha vivipara, Opuntia polyacantha, and Pediocactus simpsonii, which range to over 3000 m altitude in southern Wyoming, were quite cold tolerant (50% inhibition of staining occurred from -17° to -20°C), while O. bigelovii and O. ramosissima, which are restricted to much warmer habitats, were not very cold tolerant (50% inhibition from -4° to -7°). Relationships among tissue cold sensitivity, morphological features which protect the stems from low temperatures, and the occurrence of species in progressively colder regions were investigated. Differences in tissue cold sensitivity accounted for the =600 m higher elevational limit of Coryphantha vivipara var. rosea compared to the morphologically similar var. deserti in southern Nevada. In contrast, morphological differences alone could adequately explain the relative northern limits of the columnar cacti Carnegiea gigantea vs. Stenocereus gummosus and the barrel cacti Ferocactus acanthodes vs. F. wislizenii in the southwestern United States, as previously indicated using a computer model. Differences in both morphology and tissue cold sensitivity apparently influenced the relative northern ranges of Lophocereus schottii with respect to the other columnar cacti and F. covillei with respect to the other barrel cacti, as well as the relative elevational range of Denmoza rhodacantha with respect to Trichocereus candicans in northcentral Argentina. Cold hardening in response to decreasing day/night air temperatures was observed for 10 species.

## 5510 Physiological Systems

*REFER ALSO TO CITATION(S) 3043*

## 5520 Public Health

*REFER ALSO TO CITATION(S) 3380*

## 5530 Agriculture And Food Technology

3389 **(INIS-mf—8050) Isotope and radiation applications to agricultural development in Asia and the Pacific Region. Speech given during the seminar.** Lamm, C.G. (Food and Agriculture Organization of the United Nations, Rome (Italy); International Atomic Energy Agency, Vienna (Austria)). 1981. 13p. (CONF-8106294—7). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703607.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

Use of nuclear techniques have been recognized to be invaluable tools in agricultural research for increasing crop production and reducing food losses in the technologically developed countries. The objectives of FAO/IAEA programme are to exploit the potential of isotopes and radiation applications in R and D for increasing and stabilizing agricultural production, reducing production costs, improving food quality, protecting agricultural products from spoilage and losses and minimizing pollution of food and the agricultural environment..

# 56 BIOMEDICAL SCIENCES, APPLIED STUDIES

## 5601 Radiation Effects

*REFER ALSO TO CITATION(S) 2002, 3198, 3272, 3299, 3331, 3349, 3383, 3383, 4271*

3390 **(AD-A—131229/7) High altitude radiation exposure in the SR-71: a preliminary report. Professional study.** DeHart, R.M. (Air War Coll., Maxwell AFB, AL (USA)). Apr 1974. 23p. NTIS, PC A02/MF A01.

A study to measure radiation received by SR-71 crews at high altitudes began at Beale AFB, California in 1971. Data gathered during the first eighteen months are presented. Radiation was measured by a thermoluminescent dosimeter provided by the USAF Radiological Health Laboratory (AFLC).

3391 **(AD-A—131339/4) Antiemetic studies both pre and post exposure: preliminary findings. Preliminary report Jan-Oct 82.** Cordts, R.E.; Yochmowitz, M.G. (School of Aerospace Medicine, Brooks AFB, TX (USA)). Jul 1983. 13p. NTIS, PC A02/MF A01.

Initial findings of the latest testing of radiation antiemetic drug treatments are described. Four groups of random-source dogs, each with at least 13 dogs, were exposed to varying levels of radioactive cobalt using the up-down test paradigm. Cimetidine, thiethylperzaine, and promethazaine have been tested previously in this laboratory and have been shown to be effective, in combination, in curtailing radiation-induced emesis. Testing described herein used the same three drugs, but they were injected following radiation (group 1). Group two animals were injected with saline following radiation. Group three animals were administered the same three drugs plus the corticosteriod dexamethasone prior to being irradiated. Group four received saline prior to irradiation. Only the combination of four drugs given prior to irradiation was effective in altering the incidence of emesis.

3392 **(DOE/EV/04472—T3) Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983.** Evans, H.H. (Case Western Reserve Univ., Cleveland, OH (USA)). 30 Sep 1983. Contract AC02-77EV04472. 27p. NTIS, PC A03/MF A01. Order Number DE84000837.

Mutant strains were selected which are deficient in various DNA repair pathways and these were studied with regard to (1) the nature of the defect in repair, and (2) the mutability and transformability of the defective cells by various agents as compared to the wild type parental cells. Lightly mutagenized wild-type cells were infected with irradiated herpes simplex virus (HSV). Cells which repair HSV are lysed so the surviving population is enriched in repair-deficient cells. Six strains which survived two rounds of infection were characterized with respect to their radiosensitivity.

3393 **(FRNC-TH—1148) Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays.** Mouthia-Khadija. (Montpellier-2 Univ., 34 (France)). Dec 1981. 175p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83704395.

Mutagenic treatments produce a large number of mutants per unit time and are used for plant improvement. However these treatments cause damage to cells. To counteract this radio-induced damage 2 methods are being tried: - Protection, which consists in the supply of an active product before application of mutagenic agents; - Restoration, which tries to repair the damage after mutagenic treatment. This work is devoted to restoration processes. Technique for the isolation and culture on a suitable nutrient of rice embryos (Oryza sativa L, Cigalon variety) separated from non-irradiated caryopses were developed first. By separating out the embryo in this way it is possible to study in vitro the interactions between the embryo and the rest of the caryopsis (albumin + pericarp). The effects of radiations on embryos from caryopses exposed to cobalt 60 gamma rays were measured next, then the action of certain inorganic elements contained in the caryopsis tissues was analysed. On the basis of the first results obtained the differences in response between plantlets from embryos irradiated or otherwise treated or not either by zinc sulphate or by very silice-rich volcanic products (Tuf and Pouzzolane), were examined by chemical analysis techniques. These tests have allowed the detection of ionic changes induced by irradiation during the different stages of plant development and led to a better estimate of the radio-restoration mechanisms brought about by the various chemical compounds used.

3394 (ORNL—5933, pp 75-97) **Biotechnology and environmental programs.** Sep 1983. NTIS, PC A09/MF A01.

In Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.

This section reviews research and development in the following areas: (1) chemical processes that utilize living microorganisms or active fractions from living organisms; (2) advanced automated techniques for application to analyses of physiologic fluids and to chemical process control; (3) monitoring of fossil energy process facilities to determine environmental suitability; and (4) chemical processes for pollution abatement.

3395 **Melanoma case-control study at the Los Alamos National Laboratory.** Acquavella, J.F.; Wilkinson, G.S.; Tietjen, G.L.; Key, C.R.; Stebbings, J.H.; Voelz, G.L. (Las Alamos National Lab., NM). *Health Physics;* **45**: No. 3, 587-592(Sep 1983). Contract W-7405-ENG-36.

A melanoma case-control study was conducted at the Los Alamos National Laboratory to investigate whether related occupational exposures or personal characteristics of employees could be identified. This study was prompted by a recent report from the Lawrence Livermore National Laboratory that melanoma was much more frequent than expected among employees and that persons suffering from melanoma more often worked as chemists. Our investigation did not uncover an association with plutonium body burden, cumulative external radiation exposure, or employment as a chemist or a physicist. The major finding was that cases were more educated than controls. Melanoma risk was 2.11 among college-educated employees and increased to 3.17 among those with graduate degrees (Mantel-extension linear trend probability - 0.038). This finding is consistent with the often reported increased melanoma incidence among persons of higher social class. It points to personal characteristics, particular to persons of higher educational attainment, as risk factors for melanoma at the Los Alamos National Laboratory.

3396 **Review of three incidents involving the release of $^{125}$I from seeds interstitially implanted within the prostate gland.** Broga, D.W.; Gilbert, M.A. (Medical College of Virginia, Richmond). *Health Physics;* **45**: No. 3, 593-597(Sep 1983).

Three cases have occurred at the Medical College of Virginia in which $^{125}$I seeds were accidentally ruptured while being interstitially implanted within cancerous prostate-gland tumors. During the first incident the physician performing the surgery was contaminated. In the second and third cases, the iodine seeds were postoperatively discovered to be leaking. Both patients demonstrated significant thyroid uptakes and were administered potassium iodide as a blocking agent. Routine urine analyses and thyroid bioassays were performed during a period of several months to study the removal of $^{125}$I from the thyroid and to determine the effect potassium iodide had on the iodine-removal rate. Data obtained during the follow-up studies emphasize the necessity of post-operative monitoring and point out the value of administering a blocking

agent in cases involving the release of $^{125}I$ from a ruptured seed. The findings also indicate the risks during this type of therapeutic procedure may warrant the prophylactic use of exogenous iodine prior to implanting the iodine seeds.

3397 **Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen.** Fisher, D.R.; Jackson, P.O.; Brodaczynski, G.G.; Scherpelz, R.I. (Battelle Pacific Northwest Lab., Richland, WA). *Health Physics;* **45**: No. 3, 617-629(Sep 1983). Contract AC06-76RL01830.

Pacific Northwest Laboratory conducted a research program to measure uranium and thorium levels in excreta of uranium mill crushermen who are routinely exposed to airborne uranium ore dust. The purpose of this work was to determine whether $^{230}Th$ was preferentially retained in the body over either $^{234}U$ or $^{238}U$. Urine and fecal samples were obtained from 14 active crushermen with long histories of exposure to uranium ore dust, plus four retired crushermen and three control individuals for comparison. Radiochemical procedures were used to separate out the uranium and thorium fractions which were then electroplated on stainless steel discs and assayed by a spectrometry. Significantly greater activity levels of $^{234}U$ and $^{238}U$ were measured in both urine and fecal samples obtained from uranium mill crushermen, indicating that uranium in the inhaled ore dust was cleared from the body with a shorter biological half-time than the daughter product $^{230}Th$. The measurements also indicated that uranium and thorium separate in vivo and have distinctly different metabolic pathways and transfer rates in the body.

3398 **Dose-rate conversion factors for external exposure to photons and electrons.** Kocher, D.C. (Oak Ridge National Lab., TN). *Health Physics;* **45**: No. 3, 665-686(Sep 1983). Contract W-7405-ENG-26.

Dose-rate conversion factors for external exposure to photons and electrons have been calculated for approx. 500 radionuclides of potential importance in environmental radiological assessments. The three exposure modes considered are immersion in contaminated air, immersion in contaminated water, and irradiation at a height of 1 m above a contaminated ground surface. For each exposure mode, the source region is assumed to be effectively semi-infinite or infinite in extent with uniform radionuclide concentration. The dose-rate factors then give external dose-equivalent rates per unit radionuclide concentration in air, in water or on the ground surface. The results are tabulated in this paper in the form of effective dose-rate factors based on the definition of the effective dose equivalent given in ICRP Publication 26 (ICRP77). The effective dose-rate factors are obtained from photon dose-rate factors for 23 separate body organs and electron dose-rate factors for skin calculated with the revised DOSFACTER computer code. In addition to presenting the dose-rate factor equations and the tabulated results, this paper emphasizes the assumptions underlying the calculations for each exposure mode, differences between the organ dose-rate factors for photons used here and those used previously with the original version of the DOSFACTOR code, and limitations inherent in application of the idealized external dose-rate factors to realistic environmental radiological assessments.

3399 **Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area.** Halford, D.K.; Markham, O.D. (Radiological and Environmental Sciences Lab., Idaho Falls, ID). *Health Physics;* **45**: No. 3, 745-756(Sep 1983).

The biological elimination of nine $\gamma$-emitting radioisotopes was studied in mallards (Anas platyrhynchos) which were released onto liquid radioactive waste ponds in southeastern Idaho. After 68, 75 or 145 days, the ducks were removed from the contaminated environment and placed in metabolic cages. Whole-body and feces-urine counts were made for 51 days and then the ducks were sacrificed and dissected for tissue analyses. The biological elimination of radioisotopes were fit to two compartment models using non-linear least squares estimation. Fecal-urine data substantiated two-compartment elimination of all radionuclides. Biological half-lives in mallards were 10 days ($^{131}I$), 22 days ($^{140}Ba$), 86 days ($^{51}Cr$), 32 days ($^{58}Co$), 26 days ($^{75}Se$), 67 days ($^{65}Zn$), 10 days ($^{134}Cs$), 67 days ($^{60}Co$) and 11 days ($^{137}Cs$). Body burdens in ducks were at 90% of equilibrium with the radioactive waste pond water at the time of removal from the waste ponds. Tissue distribution of radionuclides on the day of removal from the ponds showed gut to have the highest concentrations followed by feather, liver and muscle. After 51 days in metabolic cages, feather had the greatest radionuclide concentrations followed by liver, muscle and gut. Liver contained the greatest variety of radionuclides and muscle the smallest.

3400 **Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure.** Cool, D.A.; Maillie, H.D. (Univ. of Rochester, NY). *Health Physics;* **45**: No. 3, 791-794(Sep 1983).

Laser fusion targets, in their simplest form, are hollow glass spheres referred to as microballoons. As a result of the loading process, the glass matrix becomes contaminated with tritium, with a specific activity of approx. 0.5 to 1 Ci/g it has been pointed out that microballoons are susceptible to breakage during normal handling procedures, resulting in small airborne fragments that may be inhaled. The dissolution pattern of an inhaled material is an important physicochemical parameter in the clearance of that material from the pulmonary parenchyma. In vivo dissolution reflects the physiological conditions existing in the lung. The behavior of tritiated glass fragments in the lung has not been examined rigorously. This note will present the results of in vitro dissolution experiments on tritiated microballoon glass fragments which have been conducted as part of an overall evaluation of the behavior of the material in the body.

3401 **Tissue, cellular, and subcellular distribution of $^{241}Pu$ in the rat testes.** Miller, S.C.; Bowman, B.M. *Radiation Research;* **94**: No. 2, 416-426(May 1983).

The distribution and localization of $^{241}Pu$ in rat testes were determined by quantitative autoradiography. Rats were given intravenous injection of $^{241}Pu$ citrate and tissues were collected 1 week later. The tissue distribution of $^{241}Pu$ was determined by light microscope autoradiography. Significant concentrations of $^{241}Pu$ were observed in the interstitial tissue but not in seminiferous tubules. The cellular distribution and subcellular localization of $^{241}Pu$ were determined by electron microscope autoradiography. Within the interstitial tissue, $^{241}Pu$ was concentrated in microphages. There was no preferential localization of $^{241}Pu$ in any other interstitial tissue components. Within interstitial tissue macrophages, $^{241}Pu$ was concentrated in the lysosomal system of the cell. Other organellar compartments of the cell did not preferentially incorporate $^{241}Pu$. The association of $^{241}Pu$ with the macrophage lysosomal system may explain the long retention times of Pu in testes as observed in experimental studies.

3402 **The effect of x rays, DTPA, and aspirin on the absorption of plutonium from the gastrointestinal tract of rats.** Sullivan, M.F.; Gorham, L.S.; Miller, B.M. (Pacific Northwest Lab., Richland, WA). *Radiation Research;* **94**: No. 1, 89-96(Apr 1983). Contract AC06-76RL01830.

To measure the effect of radiation on plutonium transport, rats that were exposed to 250-kVp X rays were given $^{238}Pu$ 3 days afterwards by either gavage or injection into a ligated segment of the duodenum. In a second group of experiments, rats were either injected intraduodenally with $^{238}Pu$-DTPA or administered the chelate intravenously and the $^{238}Pu$ by gavage. In a third experiment, rats that had been gavaged with 200 or 400 mg/kg/day of aspirin for 2 days were injected intragastrically with $^{238}Pu$ nitrate. Results of the first experiment showed a dose-dependent increase in $^{238}Pu$ absorption between 800 and 1500 rad of lower-body X irradiation. Intravenous or intraduodenal injections of DTPA caused a marked increase in $^{238}Pu$ absorption but resulted in decreased plutonium deposition in the skeleton and liver. Retention of $^{238}Pu$ in the skeleton of rats given aspirin was double that of controls, but the effect on plutonium absorption was less marked than that of DTPA.

3403 **The effect of mass on the gastrointestinal absorption of plutonium and neptunium.** Sullivan, M.F.; Miller, B.M.; Ryan, J.L. (Pacific Northwest Lab., Richland, WA). *Radiation Research;* **94**: No. 1, 199-209(Apr 1983). Contract AC06-76RL01830.

Absorption and retention of plutonium were determined in mice after intragastric administration of either 6 x $10^{-4}$ or 1.5 mg/kg in bicarbonate, citrate, or nitrate media. At the higher concentration, absorption of the citrate was greater than that of the nitrate; at the lower concentration, chemical form was not an important factor in absorption. Concentration and chemical form had much less influence on absorption by the neonatal (versus the adult) rat. The transfer factor ($f_1$) for neonates was between one and two orders of magnitude higher than for adults. Absorption and retention of neptunium were determined in rats and/or mice after intragastric administration at doses ranging from 2.2 x $10^{-7}$ to 43 mg/kg in nitrate solutions of pH 1.5. At the higher concentrations, absorption was 1.5 to 2.7%. For lower concentrations, absorption was 25 to 65 times less. In contrast to results obtained in adult animals, absorption of neptunium by neonates decreased with increasing dose. The data obtained in adult animals suggest that the $f_1$ factor recommended by the ICRP for plutonium should be increased by a factor of 10, but the neptunium $f_1$ factor, in contrast, should be decreased by a factor of 10.

3404 **Radium retention in mature beagles injected at 5 years of age.** Lloyd, R.D.; Bruenger, F.W.; Jones, C.W.; Taylor, G.N.; Mays, C.W. (Univ. of Utah, Salt Lake City). *Radiation Research;* **94**: No. 1, 210-216(Apr 1983). Contract AC02-76EV00119.

Retention of $^{226}$Ra was substantially lower in mature beagles injected at 5 years of age compared to corresponding values for young adult beagles injected at 17 months of age. As with young adults, the percentage retention in mature dogs given about 10 μCi/kg exceeded that in mature dogs given 4 μCi/kg or less. Measured $^{222}$Rn/$^{226}$Ra ratios in bone were similar in mature and young adults. Roughly 66% of the injected radium was excreted by mature dogs during the first 3 weeks, about two-thirds of the total excretion appearing in the feces. Distribution of $^{226}$Ra within the skeleton was similar in mature and young adult beagles.

3405 **Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats.** Sanders, C.L.; Mahaffey, J.A. (Pacific Northwest Laboratory, Richland, WA). *Radiation Research;* **94**: No. 1, 66-80(Apr 1983). Contract AC06-76RL01830.

Wistar rats were given a single inhalation exposure to high-fired $^{241}AmO_2$ particles and examined over their life span. A total of 310 rats were used: 259 exposed to $^{241}$Am for life-span study, 30 exposed to $^{241}$Am for early metabolism study, and 21 unexposed life-span controls. The activity median aerodynamic diameter of the aerosols was 0.75-1.39 μm. About 55% of alveolarly deposited $^{241}$Am was cleared from the lung with a half-life of 0.5 days, 37% with a half-life of 7 days, and 8% with a half-life of 580 days. Group mean lung doses ranged from <5.7 rad up to 1500 rad. Significant early mortality due to radiation pneumonitis was seen only in the highest exposure group. The percentage of rats with lung tumors was 0% for controls (21 rats), 1% at lifetime lung doses <10 rad (139 rats), 7% at 10-50 rad (86 rats), 0% at 50-100 rad (9 rats), 60% at 100-500 rad (10 rats), and 7% at 500 rad (15 rats). Only one liver and one bone tumor were found in all exposed rats, both at lifetime tissue doses <10 rad. The fate and carcinogenicity of inhalated $^{241}AmO_2$ in the lung of rats were similar to what has previously been described for inhaled $^{244}CmO_2$.

3406 **Solutions for the ICRP gastrointestinal activity from inhaled radioactive aerosols.** Maillie, H.D. (Univ. of Rochester School of Medicine and Dentistry, NY). *American Industrial Hygiene Association Journal;* **44**: No. 4, 306-309(1983). Contract AC02-76EV03490.

The International Commission on Radiological Protection (ICRP) has developed linear differential equations to define the movement of the fraction of inhaled radioactivity that goes to the gastrointestinal tract. These equations are based on assumed bioloigcal removal constants for each of three aerosol classes. The graphical method presented here allows the determination of the total number of nuclear transformations that occur in each gastrointestinal compartment when a given class aerosol is inhaled. The method takes into account the radioactive half-life of the isotope, the intestinal absorption fraction, and the aerosol size.

3407 **Nuclear War.** MacLeod, G.K. (Univ. of Pittsburgh, PA). *JAMA, the Journal of the American Medical Association;* **250**: No. 14, 1907(1983).

Several chapters in Last Aid warrant the attention of the medical profession. What is known and not known about acute biologic effects following a nuclear explosion is described. The social, physical, and environmental impact of nuclear war on urban population centers is described. How nuclear weapons could affect the composition of the ozone layer and the effects this could have on human survival, including possible interruption of the aquatic ecosystem to produce single-cell organisms for the food cycle, especially seafood is noted.

## 5602 Thermal Effects

3408 **(DOE/EV/00900—6) Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report.** Esch, G.W.; Hazen, T.C. (Wake Forest Univ., Winston-Salem, NC (USA). Dept. of Biology; Puerto Rico Univ., Rio Piedras. Dept. of Biology). 1983. Contract AS09-76EV00900. 28p. NTIS, PC A03/MF A01. Order Number DE84002649.

Red-sore disease is a rather recent problem for those involved in the sport and commercial fishing industries in the southeastern United States. The causative, or etiological, agent for red-sore disease is the widespread and commonly occurring bacterium, Aeromonas hydrophila. The disease is characterized by both external and internal lesions with serious damage to internal organs ultimately causing death of the host. Evidence points to the existence of several strains of Aeromonas hydrophila with some more virulent than others. The prevalence of the disease is related to elevated water temperature and body condition.

## 5603 Chemicals Metabolism And Toxicity

*REFER ALSO TO CITATION(S) 1811, 1811, 3256, 3284, 3385, 3386, 3402, 4258*

3409 **(CONF-821048—3) Structure activity relationships: their function in biological prediction.** Schultz, T.W. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA). Dept. of Animal Science; Virginia Commonwealth Univ., Richmond (USA). Dept. of Pharmaceutical Chemistry). 1982. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01. Order Number DE84001997.

From 5. Life Sciences symposium on synthetic fossil fuel technologies; Gatlinburg, TN, USA (24 Oct 1982).

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Quantitative structure activity relationships provide a means of ranking or predicting biological effects based on chemical structure. For each compound used to formulate a structure activity model two kinds of quantitative information are required: (1) biological activity and (2) molecular properties. Molecular properties are of three types: (1) molecular shape, (2) physiochemical parameters, and (3) abstract quantitations of molecular structure. Currently the two best descriptors are the hydrophobic parameter, log 1-octanol/water partition coefficient (log P), and the $^{1}$X/sup v/(one-chi-v) molecular connectivity index. Biological responses can be divided into three main categories: (1) non-specific effects due to membrane perturbation, (2) non-specific effects due to interaction with functional groups of proteins, and (3) specific effects due to interaction with receptors. Twenty-six synthetic fossil fuel-related nitrogen-containing aromatic compounds were examined to determine the quantitative correlation between log P and $^{1}$X/sup v/ and population growth impairment of Tetrahymena pyriformis. Nitro-containing compounds are the most active, followed by amino-containing compounds and azaarenes. Within each analog series activity increases with alkyl substitution and ring addition. The planar model log BR = 0.5564 log P + 0.3000 $^{1}$X/sup v/ -2.0138 was determined using mono-nitrogen substituted compounds. Attempts to extrapolate this model to dinitrogen-containing molecules were, for the most part, unsuccessful because of a change in mode of

action from membrane perturbation to uncoupling of oxidative phosphoralation.

3410 **(DOE/ER/60076—1) Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983.** Warshawsky, D. (Cincinnati Univ., OH (USA). Dept. of Environmental Health). 31 Oct 1983. Contract AC02-82ER60076. 37p. NTIS, PC A03/MF A01. Order Number DE84002342.

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Dibenz(a,j)acridine [D(a,j)A] is metabolized by rat liver microsomes which results in the formation of seven major metabolites. Under the present conditions of the microsomal assay, 55% of D(a,j)A is metabolized by corn oil induced microsomes in 30 minutes, whereas 80% of D(a,j)A is metabolized by 3MC induced microsomes in 60 minutes. In the presence of the 3MC induced microsomes, a metabolite in fraction 19 is produced very rapidly and disappears linearly over 60 minutes. Of the major metabolites of D(a,j)A produced by microsomal incubations metabolites in fractions 11-12, 13 and 19 are possibly the 5,6-dihydrodiol of D(a,j)A, definitely the 3,4-dihydrodiol of D(a,j)A and a phenol or epoxide respectively. BaP pretreatment of the New Zealand white rabbits doubles the rate of appearance of the metabolites of D(a,j)A in the blood in the IPL. With or without pretreatment, the major metabolites are found in fractions 13 and 19 with 70 to 80% of the activity present in the nonextractable fraction. At the end of the perfusion 50% of the D(a,j)A remains in the IPL following BaP pretreatment as compared to 72% without pretreatment. This increased rate of metabolism due to BaP pretreatment results in the appearance of more conjugated metabolites at the end of the perfusion in the mercaptan fraction.

3411 **(FOA-C—40107-C3) Effect of cadmium on transmitter transportation.** Estborn, L.; Olofsson, B.; Sellstroem, Aa. (Foersvarets Forskningsanstalt, Umea (Sweden)). Apr 1983. 11p. (In Swedish). Foersvarets Forskingsanstalt, Umea, Sweden.

The effect of Cadmium (Cd) on a rate-limiting step in neurotransmission; the transmitter inactivating high-affinity $\gamma$-aminobutyric acid (GABA) transport was studied. The uptake of $^3$H-GABA into isolated pinched-off nerve-terminals was totaly surpressed at Cd concentrations above $10^{-4}$ M. This effect was probably due to an indirect effect on the neuronal membrane potential.

3412 **(KHM-TR—71) Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function.** Leffler, P.; Nordstroem, S. (Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE). Mar 1983. 37p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751427.

Levels of six metals - Pb, Cd, Hg, Sb and Se - in maternal and umbilical cord blood, were studied in pregnancies of 9 female employees at a Swedish smelter and another 12 females living close to the smelter. The frequency distribution of all six elements were analyzed in 15 of the 21 pregnancies. In the remaining pregnancies only Pb-levels were analyzed. Blood was collected twice during pregnancy (pregnancy-week 12-25 and 31-36 respectivelly), and from both mother and fetus (umbilical cord) at delivery. Placental transmission of Sb from maternal to fetal blood was also studied in three pregnant Syrain Golden hamsters, intratracheally exposed on the 13th or the 15th day after fecundation. This part of the study was concentrated on Sb. Results suggested increased bloodlevels of Pb, Hg and As in employees compared with females living close to the smelter. Employees who had been working at the smelter more than 50 percent of the pregnancy period showed significant higher bloodlevels of Hg and a tendency towards increased levels of As, compared with women employed less than 50 percent. The main purpose with the human study was to test the hypothesis that the placental barrier function may possibly change with the number of pregnancies in each woman. Results suggested that there may be variations in placental transfer of Pb and Hg with regard to pregnancy order. The main purpose with the experimental test was to study if there is a placental transport of Sb from maternal to fetal blood. The results showed that this is true in the Syrian Golden hamster. Concentration gradients found, suggested a possible barrier function of the placenta. Causal connections with occupational reproductive hazards are probably very complex, involving difficulties in distinguishing specific agenst from others. Metals emitted from smelter processes, such as As, Pb, Cd and Hg, may however, cause damaging effects on the proliferation activities and thus damage the developing fetus.

3413 **(KHM-TR—78) Effect of arsenic on the system.** Lagerkvist, B.; Linderholm, H.; Nordberg, G.; Blom, S.; Thorulf, P. (Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE). Mar 1983. 59p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751428.

An epidemiologic and clinical study with the aim to look for possible adverse effects, particularly on the circulatory and peripheral nervous systems, by inorganic airborn arsenic (As) was carried out involving 47 As-exposed smelter workers. The controls were 47 male workers from a mechanical industry, who were not exposed to arsenic and who matched the arsenic workers in age, smoking habits and use of vibrating hand tools. Perforation of the nasal septum - probably an effect of a previous more intense exposure to arsenic than at present - was seen in 20 per cent of the smelter workers and in none of the controls. A higher prevalence of vasospastic reaction in the fingers during local cooling was found among the smelter workers and those who had not used vibrating hand tools had a higher prevalence of white fingers, Raynauds phenomenon. These differences were statistically significant. There was a somewhat higher prevalence of symptoms and signs of coronary heart disease in arsenic exposed men but this difference was not statistically significant. One of the As-exposed men had had a malignant skin tumor. Clinical and electromyographic signs of peripheral polyneuropathy were seen to the same extent in arsenic workers and controls. The As-workers had a somewhat lower mean conduction velocity in peripheral nerves and there was a statistically singficant difference between the groups. Mean concentrations of inorganic and methylated arsenic compounds in urine were 71 $\mu$g/l in As-exposed man and 7 $\mu$g/l in non-exposed man. There was no correlation between urinary concentration of arsenic and vasospastic reaction in the fingers of the As-exposed smelter workers.

3414 **(KHM-TR—83) Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review.** Nordstroem, S.; Forsberg, B. (Umeaa Univ. (Sweden)). (Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE). Mar 1983. 39p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751429.

Air pollutions include a number of toxic agents emitted from fossil fuels (NOsub (x), $SO_2$, CO, POM heavy metals). Epidemiological studies of health effects from such pollutions have been performed concerning lung cancer and cancer mortality, diseases in the respiratory and circulatory systems, infant mortality and total morbidity/mortality. Very few studies on reproductive hazards (except for effects from tobacco smoke) have been presented in the literature. This is noticeable, as the embryo or the fetus is more sensitive to toxic factors than children and adults. The first trimester in utero, including the organogenesis, is the most sensitive period. Even the last trimester of pregnancy is, however, a sensitive period, in that we have increasing evidents that toxic agents may cross the placenta and affect the growing and developing fetus. Epidemiological studies performed, suggest that in populations living in polluted areas, there are effects on fertility, fetal mortality, and birth weights. In Swedish studies decreased birth weights were found in polluted areas especially in later pregnancies ($> 2$). The significance of this pregnancy order effect is so far not known. Thus, increased levels of air pollutions may involve incrased risks of fertility problems and fetal damage. Consequently, continous risk evaluations and risk estimates should be imperative.

3415 **(KHM-TR—85) Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland.** Maekinen, A. (Univ. of Helsinki, Helsinki (Finland)). (Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE). May 1983. 118p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751430.

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From the 7 elements studied, average concentrations of 6 (As, Cr, Cu, Ni, V and Pb) increase from the southwestern archipelago towards the east and northeast. Zinc shows higher concentrations near the populated regions in the periphery of the study area. The prevailing wind direction in the study area is from the southwest. The land rises towards inland and therefore the precipitation increases resulting in higher deposition rates. The density of population and traffic and other human influences increase from the coast and this may partly obscure the emission effect on depostion. A clear relationship was demonstrated between lead concentration of Hylocomium and the vicinity of the western Helsinki region with higher traffic density. The coastal zone of western Uusimaa can be considered as a relatively pure region. However some polluted areas may be pointed out. Several sampling points and subareas with elevated values are found. The Helsinki region is one of most polluted subareas. The others are the regions of Lohja and Pohja. A detailed analysis of the metal concentrations as a function of the distance from the power plant shows higher concentrations of Ni, V and possibly of As, Cr, and Cu in Hylocomium in the vicinity of the Inkoo power plant. Vanadium and nickel increase most distinctly towards the power plant. Besides emissions of coal fly-ash, higher levels of nickel and vandium in the immediate vicinity of the power plant may also arise from fuel oil emissions.

3416 **(KHM-TR—87) Respiratory effects of air pollutants.** Camner, P.; Ewetz, L.; Lindvall, T. (Statens miljoemedicinska laboratorium, Stockholm (Sweden)). (Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE). Mar 1983. 59p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751431.

The evaluation of the effects of long-term exposure and 24 hr exposure to $SO_2$ and particles is based mainly on epidemiological data. Together with other pollutants $SO_2$ and particles can produce an increased incidence of acute and chronic symptoms in airways and impaired lung function in adults. These effects occur at annual means of about 100 $\mu g/m^3$ and at daily means of 150-300 $\mu g/m^3$. In recent studies of short term exposure to $SO_2$ healthy adults exhibited increased airway resistance at 3000 $\mu g/m^3$ and asthma patients at 700 $\mu g/m^3$, measured during physical exercise. The outdoor threshold limit value for 1 hr (at most 1 per cent of the time) which is at present used in Sweden is almost equal to the level at which asthmatics are affected. Risk evaluation of $NO_2$ is based almost entirely on experimental data. Experiments using humans and animals indicate adverse effects such as irritation and/or increased susceptibility to bacterial infections in airways as a result of exposure to about 1000 $\mu g$ $NO_2/m^3$. Recent experiments in humans indicate that levels lower than 1000 $\mu g/^3$, may be as low as 200-500 $\mu g/m^3$, might affect lung function. Data on these low levels must however be considered ambiguous. As a rather large number of people in Sweden, healthy as well as ill, may be exposed to levels of about 200 $\mu g/m^3$ and above, it is reasonable to suspect that adverse effects are produced at the levels occuring today in urban areas. Short-term exposure to ozone can produce adverse effects at levels of 200-500 $\mu g/m^3$. In epidemiological studies short-term exposure to 200-500 $\mu g$ $O_3/m^3$ has been associated with impaired lung function in adults and children, increased frequency of asthmatic symptoms and irritation of the eyes as well as reduced athletic capacity. It should be emphasized that a larger number of people are exposed to high levels of oxidants than to high levels of $NO_2$, in outdoor situations.

3417 **(LA-UR—83-3110) Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components.** Okinaka, R.T.; Nickols, J.W.; Whaley, T.W.; Strniste, G.F. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 13p. (CONF-8310179—1). NTIS, PC A02/MF A01. Order Number DE84001747.

From 8. international symposium on polynuclear aromatic hydrocarbons; Columbus, OH, USA (26 Oct 1983).

This report compares the mutagenicity of photochemical products produced by exposure of the polycyclic aromatic hydrocarbons benzo(a)pyrene and 9,10-dimethylanthracene or the aromatic amines 2-aminofluorene, 2-aminoanthracene and 2-aminonaphthalene to sunlight or to ultraviolet light (UVA). 2-Aminofluorene, giving the most active products, was further investigated with respect to the mechanism of photoactivation and the chemical identity of the photochemical products. Screening of HPLC resolved photochemical products demonstrated that the majority of the mutagenicity was localized to one peak - which co-chromatographed with 2-nitrofluorene.

3418 **(PB—83-243246) Sample collection and preparation methods affecting mutagenicity and cytotoxicity of coal fly ash.** Mumford, J.; Lewtas, J. (Health Effects Research Lab., Research Triangle Park, NC (USA)). Jul 1983. 24p. (EPA—600-D-83-061). NTIS, PC A02/MF A01.

Reports by several investigators describing the biological activity of coal fly ash have presented a variety of results which in some cases are conflicting. The biological activity of coal fly ash may differ because of one or more of the following factors: (1) the samples studied were from different sources; (2) the samples were prepared for bioassay differently; (3) the sampling method differed, and, therefore, collected samples were different in chemical or physical properties which affect the biological activity. Several variables involved in coal fly ash studies -- source, sample collection land preparation methods, bioassay method -- are undoubtedly responsible for the diversity of biological effects observed. The objectives of this study were to examine the sample preparation and collection factors which may affect the observed biological activity caused by coal fly ash and to evaluate the mutagenicity and cytotoxicity of fluidized-bed combustion (FBC) fly ash from experimental and commercial units. The bioassays used in this study were the Ames Salmonella plate incorporation test for mutagenicity and the rabbit alveolar macrophage (RAM) system for cytotoxicity.

3419 **(PB—83-246058) Services to operate and maintain a diesel exhaust exposure system for chronic animal inhalation exposure studies. Final report.** (DeBra (Fred B.) Co., Cincinnati, OH (USA)). 16 Jan 1983. 58p. NTIS, PC A04/MF A01.

During the years 1978 to 1981, NIOSH and EPA have jointly conducted a research study to evaluate the health effects resulting from exposure to diesel exhaust and coal dust. This was accomplished through an interagency agreement. The availability of EPA's Center Hill Laboratory and experienced personnel provided the feasibility for this effort. As a result of new resource limitations, EPA experienced a reduction of force causing them to remove their personnel from the interagency agreement. In June 1981, the Fred DeBra Co. was awarded the contract to provide the services for the generation and monitoring of diesel exhaust in animal inhalation chambers located at the Center Hill Laboratory facility. It then became our task to operate and maintain the diesel exhaust exposure system for this chronic animal inhalation study.

3420 **(PNL-SA—9942-Rev.) Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev.** Wilson, B.W.; Pelroy, R.A.; Mahlum, D.D.; Frazier, M.E.; Wright, C.W. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1981. Contract AC06-76RL01830. 21p. (CONF-8110299—1-Rev.). NTIS, PC A02/MF A01. Order Number DE84002548.

From DOE workshop on analytical chemistry; Paris, France (1 Oct 1981).

Work over the last few years had led to the recognition that a wide variety of heteroatomic polyaromatic hydrocarbons associated with fossil fuels or products of their use may act as genotoxins. The list of mutagens and potential carcinogens in direct coal liquefaction materials alone includes a variety of heteroatomic polycyclic aromatic hydrocarbons. This chapter reviews briefly some of what is known about the genetic activity of heteroatomic PAH, and illustrates how bioassays may be used along with chemical analysis to determine the principle agents responsible for such activity in complex mixtures associated with the processing and utilization of coal-based fossil fuels. The separation and analysis of he-

terocyclic PAH in complex mixtures, as well as what is known about their behavior in various in vitro tests for genotoxicity, is discussed. Chemical and in vitro data from both microbial and mammalian systems may be related to carcinogenesis as determined by long-term animal skin painting or by initiation/promotion assays. The possible utility of these data in arriving at an improved assessment of the potential health and environmental effects of a commercially deployed coal liquefaction industry is considered. Concentrations of nitrogen-containing compounds appear to correlate in many cases to the response for most of the in vitro results in these limited studies. The general body of data on chemical carcinogenesis is therefore being looked at to determine if heteroatomic species such as nitrogen containing polyaromatic compounds may be more important in the health and environmental effects of hydrocarbon pollutants than heretofore appreciated.

3421 **Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada.** Percy, K.E. (Maritimes Forest Research Centre, Fredericton, Canada). *Water, Air, and Soil Pollution;* **19**: No. 4, 341-349(May 1983).

A regional survey of selected heavy metals and S concentrations in Sphagnum magellanicum Brid. was completed within the Maritime Provinces, Canada. The concentrations of Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, S, and Zn were used to describe regional atmospheric deposition patterns to the terrestrial surface. There are measurable inputs of all elements. The elements were accumulated in the order S > Fe > Mn > Zn > Pb > Cu > Ni > Cr > Co > Hg > Cd. The regional mean concentration for the anthropogenically derived heavy metals were lower than levels reported for northern Ontario and southern Sweden. There are no comparable data for S concentrations in Sphagnum spp. High concentrations of Pb, Hg, and S were attributed to local anthropogenic emissions. Significant correlations in concentration were determined between the element pairs Fe-Co and Ni-Cr.

3422 **Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers.** Jones, R. (Trent Univ., Ontario, Canada). *Water, Air, and Soil Pollution;* **19**: No. 4, 389-395(May 1983).

A shortage of land in some urban areas has resulted in the use of hydro corridors for garden plots. Corrosion of the galvanized steel towers (hydro towers) which support electrical transmission lines causes Zn contamination of soils and may result in uptake and concentration of the metal by plants. Furthermore, the Zn used in hot dip galvanizing may be contaminated with Cd. To determine if vegetables accumulate and are affected by Zn and Cd corroded from hydro towers, soil was collected from near hydro towers, to grow lettuce and radish in a glasshouse pot experiment. Plants grown in soil collected 1 m from a tower had concentrations of Zn 5 to 10 times higher than in plants grown in garden soil collected 10 and 90 m from a tower but concentrations were not high enough to have apparent toxic effects on growth. Concentrations of Cd in the soils, lettuce and radish plants indicated that the particular towers were not a source of Cd contamination.

3423 **The Hawaii geothermal project: phytotoxicity of geothermal separator brine, an exploratory study.** Siegel, S.M.; Kamaka, P.; Siegel, B.Z.; Crocker, T.; Kottenmeier, W. (Univ. of Hawaii at Manoa, Honolulu). *Water, Air, and Soil Pollution;* **19**: No. 3, 251-257(Apr 1983).

The Hawaii Geothermal Project (HGP) separator brine is toxic to a number of plant species, including papaya and 'ohi' a (Metrosideros). A great deal but not all of the brine toxicity on the latter is related to salinity per se. In contrast, papaya growth was stimulated by NaCl brines 3500 ppm and even higher, but inhibited by HGP brine of comparable salt content. Combinations of borate, fluoride, trace metals and salts may generate phytotoxicity. Disposal of HGP brine by direct release into the soil or groundwater is contraindicated.

3424 **Acute toxicity of water soluble fractions derived from a coal liquid (SCR-II) to three aquatic organisms.** Becker, C.D.; Fallon, W.E.; Crass, D.W.; Scott, A.J. (Pacific Northwest Lab., Richland, WA). *Water, Air, and Soil Pollution;* **19**: No. 2, 171-184(Feb 1983).

Acute toxicity screening tests were conducted with water soluble fractions (WSFs) of a solvent refined coal (SRC-II) liquid from a pilot plant and three reference organisms: the cladoceran Daphnia magna, the fathead (FH) minnow Pimephales promelas, and larvae of the midge fly Chironomus tentans. Stock WSFs typically contined 900 to 1100 mg $l^{-1}$ total carbon (TC) and 700 to 800 mg $l^{-1}$ total dye complexable phenolics, with lower concentrations of aromatic and saturate hydrocarbons and N compounds. Under standard test conditions (temperature 20°C, pH 7.3 to 8.2 and hardness 65 to 80 mg $l^{-1}$ $CaCO_3$), mean LC50 values in mg $l^{-1}$ TC were 3.3 for daphnia, 11.1 for FH minnow, and 13.7 for midge larvae. Acute toxicity was also examined under other water quality conditions (temperature 10 or 25°C, pH 6.0 or 6.5, and hardness ≃ 180 to 220 mg $l^{-1}$ $CaCO_3$). The coal liquid was less toxic to daphnids at 10°C than at 20 or 25°C, but response of other organisms at different temperatures varied. The pH of the liquid had little effect on toxicity values. All organisms were less susceptible in hard water. Chemical compositions of stock WSFs were similiar, suggesting that temperature, pH, and hardness had little effect on solubility of major synfuel components. Dilution indexes for stock WSFs were higher than for petroleum oils, and reflect the greater solubility of chemicals from the liquified coal in freshwater.

3425 **Accumulation of sediment-associated viruses in shellfish.** Landry, E.F. (Analytab Products, Inc., Plainview, NY); Vaughn, J.M.; Vicale, T.J.; Mann, R. *Applied and Environmental Microbiology;* **45**: No. 1, 238-247(Jan 1983). Contract AC02-76CH00016.

The present study focused on the importance of contaminated sediments in shellfish accumulation of human viruses. Epifaunal (Crassostrea virginica) and infaunal (Mercemaria mercenaria) shellfish, placed on or in cores, were exposed to either resuspended or undisturbed sediments containing bound poliovirus type 1 (LSc 2ab). Consistent bioaccumulation by oysters (four of five trials) was only noted when sediment-bound viruses occurred in the water column. Virus accumulation was observed in a single instance where sediments remained in an undisturbed state. While the incidence of bioaccumulation was higher with resuspended rather than undisturbed contaminated sediment, the actual concentration of accumulated viruses was not significantly different. The accumulation of viruses from oysters residing on uninoculated sediments. When clams were exposed to undisturbed, virus-contaminated sediments, two of five shellfish pools yielded viral isolates. Bioaccumulation of undisturbed sediments by these bivalves was considered marginal when related to the concentration of virus in contaminated sediments; they would only represent a significant threat when suspended in the water column. Arguments were advanced for water-column sampling in the region of the water-sediment interface to provide an accurate determination of the virological quality of shellfish harvesting waters.

3426 **Food quality of Aufwuchs from artificial streams receiving low levels of perturbations.** Clark, J.R. (U.S. Environmental Protection Lab., Gulf Breeze, FL); Cherry, D.S.; Cairns, J. Jr. *Water Resources Bulletin;* **18**: No. 5, 761-767(Oct 1982).

Protein, carbohydrate, and organic content of Aufwuchs samples from artificial streams dosed separately with chlorine, copper, or dextrose were altered by changes in the taxonomic composition or physiological condition of the community. Protein content increased as community composition shifted toward a dominance by blue-green algae or heterotrophs. Bluegreens or cyanobacteria were dominant most often in Aufwuchs developing under copper or chlorine treatments and when water temperatures approached the seasonal maximum (22.8 C-25.8 C), while heterotrophs proliferated in the dextrose-enriched stream. Due to the associated extracellular mucilage, carbohydrate content also tended to be higher when blue-green algae or bacteria were abundant. However, carbohydrate content decreased in communities developing under chlorine or copper treatments at low or moderate temperatures (3 C-22.8 C), indicating a utilization of stored photosynthetic products to adapt to the stress. The organic content of Aufwuchs was related to the extent of mucilage production and the tendency of the community to accumulate detritus and suspended inorganic sediment. Protein and carbohydrate estimates were significantly correlated with dry weight and ash-free dry weight, a result of the

copious extracellular mucilage associated with rapidly growing blue-greens and other bacteria. Estimates of Aufwuchs food quality are important in evaluating the impact of pollutants on higher trophic levels; however, the tendency of change with both taxonomic shifts and physiological adaptations tends to confound interpretations for water quality assessment.

3427 **Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital.** Stevens, F.J.; Peraino, C. (Argonne National Lab., IL). *Carcinogenesis (New York);* 7: 105-109(1982).

A computer program is described which simulates the promotion of hepatic carcinogenesis by phenobarbital in a rat population homogeneous in vulnerability to the initiating effects of 2-acetylaminofluorene. Results compare favorably with experimental data in terms of maximal percentage of rats with tumors and the suggestion of phenobarbital-dependent plateaus. (JMT)

3428 **Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism.** Fischer, S.M.; Mills, G.D.; Slaga, T.J. (Oak Ridge National Lab., TN). *Carcinogenesis (New York);* 3: No. 11, 1243-1245(1982). Contract W-7405-ENG-26.

12-O-Tetradecanoylphorbol-13-acetate promotion of skin tumors in mice can be inhibited by topical application of either the phospholipase $A_2$ inhibitor dibromoacetophenone or the cyclooxygenase-lipoxygenase inhibitors 5,8,11,14-eicosatetrayonic acid or 1-phenyl-3-pyrazolidinone. The phospholipase $A_2$ inhibitors in particular appear to be among the most potent inhibitors of skin tumor promotion known. These results support the hypothesis that at least some of the products of arachidonic acid transformation are essential for tumor promotion.

### 5604 Other Environmental Pollutant Effects

*REFER ALSO TO CITATION(S) 1806, 2045, 2046*

3429 **(AD-A—131372/5) Biological effects of millimeter-wave irradiation. Final report 15 May 81-30 Jun 82.** Gandhi, O.P.; Hill, D.W.; Riazi, A.; Wahid, P.; Wang, C.H. (Utah Univ., Salt Lake City (USA). Dept. of Electrical Engineering). Dec 1982. 37p. (UTEC—82-075). NTIS, PC A03/MF A01.

The report describes experiments on millimeter-wave effects on lambda-prophage induction in lysogenic strains of E. coli, temperature-sensitive mutants of lambda prophage, and Salmonella typhimurium cells possessing Hismutation. No frequency-sensitive irradiation effects have been observed in spite of closely spaced frequencies used in the 42-48 and 65-75 GHz bands. A new method for measuring complex permittivities of biological media, with potential for in-vivo measurements, has been proposed that alleviates the need for samples with submillimeter thicknesses. Initial results appear to be highly promising. A system to allow low-wavenumber Raman and Brillouin spectroscopy of biological media has also been set up.

3430 **(AD-A—131506/8) Influence of chronic exposure to low level pulsed microwave radiation on performance and cognitive behavior. Final report.** Lebovitz, R.M. (Texas Univ., Dallas (USA). Dept. of Physiology). 15 May 1983. 53p. NTIS, PC A04/MF A01.

A focus of effort in this laboratory has been the study of complex operant behavior in rats during, as opposed to following, exposure to MWR. So that the neurophysiological, neurotransmitter and behavioral work underway here and in other laboratories can be put in some meaningful perspective, the aim of our effort was to develop a consistent set of conclusions regarding the dose/response relationships between MWR exposure and behavioral alterations, The design of the experiments was such as to obtain data at MWR dose rates for which thermal factors might be expected to be significant.

3431 **(AD-P—001277/3) Elf (extremely low frequency) communications system ecological monitoring program. The effects of exposing the slime mold Physarum polycephalum to electromagnetic fields.** Goodman, E.M.; Marron, M.T.; Greenebaum, B. (Wisconsin Univ., Kenosha (USA). Biomedical Research Inst.). Nov 1982. 15p. NTIS, PC A02/MF A01.

Laboratory exposure of the slime mold Physarum polycephalum to weak electromagnetic fields results in a lengthened mitotic cycle and depressed oxygen consumption. This research program has been designed to ascertain if the same physiological effects are obtained when Physarum polycephalum is exposed to electromagnetic fields in the vicinity of the Wisconsin Test Facility at Clam Lake, Wisconsin.

3432 (DOE/ID—12098, pp 316-318) **Raptor electrocutions on the Idaho National Engineering Laboratory.** Watson, J.W. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Information on raptor electrocutions was collected on the Idaho National Engineering Laboratory (INEL) and in two areas adjacent to the site during winter 1982. Double-pole supported lines electrocuted no raptors while armless and crossarm poles electrocuted 54 raptors including 37 golden eagles (Aquila chrysaetos). Recommendations are made concerning the modification of hazardous poles.

## 58 GEOSCIENCES

### 5801 Geology And Hydrology

3433 (DOE/ID—12098, pp 162-171) **Late-Pleistocene vegetation history of the Idaho National Engineering Laboratory.** Davis, O.K.; Bright, R.C. Jun 1983. NTIS, PC A19/MF A01.

In Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report.

Pollen diagrams and woodrat-midden fossils show the vegetation history of the Idaho National Engineering Laboratory. About 18,000 years ago the vegetation near Rattlesnake Cave was sagebrush steppe. The vegetation became more similar to shadscale steppe about 11,400 years ago and changed back toward sagebrush steppe about 5200 years ago. The timing of vegetation change at Middle Butte Cave is similar, but this site is presently at the sagebrush-steppe juniper-woodland ecotone and the change was from juniper woodland to sagebrush steppe and back. From about 28,000 to 12,000 years ago the vegetation near Middle Butte Cave was juniper woodland or sagebrush steppe. The vegetation changes at the sites may have resulted from severe summer drought 7000 years ago and the timing agrees with the astronomical theory of climatic change.

3434 **(INS-M—59) Argon analytical procedures for potassium-argon dating.** Gabites, J.E.; Adams, C.J. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Jan 1981. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704310.

A manual for the argon analytical methods involved in potassium-argon geochronology, including: i) operating procedures for the ultra-high vacuum argon extraction/purification equipment for the analysis of nanolitre quantities of radiogenic argon in rocks, minerals and gases; ii) operating procedures for the AEI-MS10 gas source mass spectrometer.

3435 **(INS-R—309) Falls Dam, Otago, sedimentation rate measured by the caesium-137 profile.** McCabe, W.J.; Mason, W.J. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). Sep 1982. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704314.

Two cores from the dam were examined. The lead-210 was measured from Core D, but because of the high sedimentation rate

the "unsupported" lead-210 was not detectable above the "supported" lead background. Caesium-137 was determined from Core A and the profile obtained related to the pattern of the "fallout" caesium in rainwater. From this a sedimentation rate of 11 kg per sq. metre per year was calculated. In terms of the length of the core sample, this is equivalent to 1.3 cm per year.

3436 **(PB—83-241349) Energigeologi - exempel pa verksamhet inom energisektorn vid sgu (energy geology - examples of activity in the energy sector within the Swedish geological survey).** (Sveriges Geologiska Undersoekning, Uppsala). Apr 1982. 81p. (SGU—29). NTIS, PC E05/MF E01.

Increased energy costs have led to expanded research into alternative energy systems, including solar heat, earth heat and storage in earth and rock. Long term planning for these systems requires information on a number of geoparameters and other factors and parameters. Conditions for the extraction and storage of energy in the earth are largely controlled by geological circumstances. Thermal and hydraulic parameters are important in determining heat loss, storage capacity, etc. Chemical conditions are important in judging operation, functioning and maintenance of systems. Geotechnical data is important in analyzing the risk of settlement and tendency to crack with temperature changes. The report contains chapters on energy-geology applications of geological mapping, thermal parameters, natural variations of ground water temperature in Swedish friction earth, calculation of thermal diffusivity in earth based on temperature measurements in ground water observation pipes, energy wells, energy storage, energy-geology mapping and radioactive heat production by the decay of radioactive isotopes in the earth's crust. Numerous tables and charts, plus bibliographical listings following most chapters.

## 5802 Geophysics

*REFER ALSO TO CITATION(S) 1815, 1817*

3437 **(UCID—19928) Power and phase spectra for detonating cord.** Burkhard, N.R. (Lawrence Livermore National Lab., CA (USA)). Nov 1983. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01. Order Number DE84002111.

A simple mathematical model is presented for a detonating cord seismic source. This model can be used for most configurations of detonating cord. Power and phase spectra are calculated. Numerical results are presented for a straight strand detonated in the center. Time delays associated with the initiation of vertically travelling energy at low frequencies can be determined from the phase spectra. 2 references, 5 figures.

3438 **(UCRL—86248) Effects of site characteristics on near-source recordings of strong ground motion.** Campbell, K.W. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 33p. (CONF-8307105—1). NTIS, PC A03/MF A01. Order Number DE84001235.

From Workshop on site-specific effects of soil and rock on ground motion and their implications for earthquake resistant design; Santa Fe, NM, USA (26 Jul 1983).

A comprehensive near-source data base has been used to study the effects of site characteristics on recorded ground motion. Various statistical methods, including regression analyses and hypothesis testing techniques, have been complicated by various biases in these data, most notable being the interrelationship of several of the characteristics. These interrelationships cause many characteristics to be highly correlated making the separation of their effects difficult. However, the adherence to a strict set of data selection criteria and appropriate analysis techniques has minimized these problems and allowed a reasonable separation of the major effects. Site effects associated with several ground motion parameters were studied; these parameters include peak horizontal acceleration, peak vertical acceleration, peak horizontal velocity, and several high- frequency ordinates of horizontal pseudo-relative velocity. We have found that all of the ground motion parameters investigated were significantly influenced by one or more of the following characteristics: the geology and topography of the site, the size and embedment of the structure housing the instrument, and the fault mechanism of the earthquake. While the last characteristic is related to the source rather than the site, it was included because of its significant effect on the other site characteristics. 28 references, 2 figures, 3 tables.

3439 **Properties of the ground inferred from electromagnetic measurements.** Lytle, R.J. (Lawrence Livermore Lab., Univ. of California). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Antennas and Propagation;* AP-27: No. 6, 899-902(Nov 1979). Contract W-7405-ENG-48.

This is a mini-review (which is prepared for persons who are unfamiliar with a topic and need a current overview of the art) of the electromagnetic methods of determining the dielectric constant and resistivity of the ground.

3440 **Evaluation of the water gun as a marine seismic source.** Newman, P. pp 54-66 of New technologies for exploration and exploitation of oil and gas resources. Volume 1. London, England; Graham & Trotman Ltd. (1979). (EUR—6299-EN-FR-Vol.1; CONF-7904180—(Vol.1)).

From Symposium on new technologies in the development of oil and gas resources; Luxembourg, Luxembourg (18 Apr 1979).

Seismic reflection surveys use echo-sounding techniques to determine the characteristics and configuration of deeply buried rock strata. The seismic source radiates acoustic waves that are partially reflected where changes of acoustic impedance occur in the sub-surface. The nature of the radiated acoustic waveform is of fundamental importance to the success of a seismic survey, and numerous alternative types of source have been tested during recent years. A recent development, the Sodera water gun offers several attractive features for marine seismic surveys. Unlike most marine sources presently in service the water gun is an implosive device, thus avoiding bubble oscillation problems that characterize explosive sources. A project was undertaken during 1977 to evaluate the water gun as a marine seismic source. Static tests conducted in deep water established basic characteristics of the radiation signature. Comparative seismic profiles were recorded using both conventional air gun arrays and arrays of water guns. Experience shows that the water gun is a robust and reliable unit. The signature is brief, repeatable, and uncomplicated by acoustic aftershocks. Particularly well suited for high resolution surveys, the water gun is also uniquely applicable to seismic problems that require the use of effective directional source arrays. 2 references, 8 figures.

## 5803 Mineralogy, Petrology, And Rock Mechanics

*REFER ALSO TO CITATION(S) 2755*

3441 **(BMI/OCRD—4(5)) Investigation of fracture permeability around an underground opening in metamorphic rocks.** Montazer, P.M.; Hustrulid, W.A. (Colorado School of Mines, Golden (USA)). Oct 1983. Contract AC06-76RL01830;AC02-83CH10140. 204p. NTIS, PC A10/MF A01. Order Number DE84002607.

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This report is the fifth in a series describing experiments conducted by the Colorado School of Mines for the Office of Crystalline Repository Development (OCRD) to determine the extent of blast damage in rock surrounding an underground opening. The report describes the instrumentation and method for testing permeability in crystalline rock masses. We applied the instruments in the CSM/OCRD test room in the Colorado School of Mines Experimental Mine (Edgar Mine) in Idaho Springs, Colorado. Even though this mine will not be a repository site, the equipment and methodology developed in this research program is applicable to other sites. The results presented in this report consider the variation of permeability measured with injection techniques. Preliminary results of core logging and deterministic fracture mapping program are briefly discussed. An attempt has also been made to relate the permeability variations to the stress field modification due to removal of the supporting rock mass.

3442 **(LBL—16259) Investigation of equivalent porous medium permeability in networks of discontinuous fractures.** Long, J.C.S. (Lawrence Berkeley Lab., CA (USA)). Apr 1983. Contract AC03-76SF00098. 294p. NTIS, PC A13/MF A01. Order Number DE84003040.

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The purpose was to determine when a fracture system behaves as a porous medium and when it does, what is the appropriate permeability tensor for the medium. A volume of fractured rock can be said to behave like a representative volume of an equivalent porous medium when (1) there is an insignificant change in the value of the equivalent permeability with a small addition or subtraction to the test volume and (2) an equivalent permeability tensor exists which predicts the correct flux when the direction of a constant gradient is changed. A two-dimensional fracture system model was developed. The density, size, orientation, and location of fractures in an impermeable matrix are random variables in the model. Simulated flow tests through the models measure directional permeability, k/sub g/. The modeling techniques were applied to data from the Atomic Energy of Canada Ltd.'s Underground Research Laboratory facility in Manitoba, Canada. The permeabilities of models with uncorrelated length and aperture were smaller than for correlated models. A Monte Carlo type study showed that analysis of steady state packer tests would consistently underestimate the mean aperture. Finally, extension of the model to three dimensions is discussed where fractures are discs randomly located in space. 90 references, 90 figures, 22 tables.

3443 **(UCID—19923) Mechanical property measurements on Nellis Baseline Sand and Dry CARES Sand.** Abey, A.E.; Anderson, G.D.; Kusubov, A.S.; Mao, N.; Trettenero, S. (Lawrence Livermore National Lab., CA (USA)). 4 Nov 1983. Contract W-7405-ENG-48. 136p. NTIS, PC A07/MF A01. Order Number DE84002112.

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A series of mechanical properties tests was performed on remolded samples of Nellis Baseline Sand and Dry CARES Sand and on undisturbed cores of Dry CARES Sand. The tests consisted of P-V hydrostatic tests, one dimensional strain compression tests, and triaxial compression tests. Large samples (7.6-cm-diameter by 15-cm-length) were tested to a maximum stress of about 200 MPa. Smaller samples (2.5-cm-diameter by 5.0-cm-length) were tested to a maximum stress of about 800 MPa. Only large samples of the undisturbed core were tested. Selected data tabulations and plots are presented. At lower stresses, the responses of some of the small samples appeared to be stiffer than responses of the large samples. A complete data analysis has not been performed at the time this data report was prepared. 39 figures.

## 5805 Oceanography

3444 **Development of a simple upper-ocean and sea-ice model.** Pollard, D.; Batteen, M.L.; Han, Y. (Climatic Research Institute, Oregon State University, Corvallis, OR 97331). *Journal of Physical Oceanography;* **13**: No. 5, 754-768(May 1983).

Results are described for three simple numerical models of the upper ocean and sea ice with prescribed atmospheric forcing. The ability of each model version to simulate the observed sea surface temperature (SST) is assessed as a basis of comparison for future coupled experiments with atmospheric GCM's.

3445 **Self-advection of density perturbations on a sloping continental shelf.** Ping-Tung Shaw; Csanady, G.T. (Woods Hole Oceanographic Institution, Woods Hole, MA 02543). *Journal of Physical Oceanography;* **13**: No. 5, 769-796(May 1983).

Bottom water movement on the continental shelf is modeled by the nonlinear interaction between longshore bottom geostrophic flow and the density field. Bottom geostrophic velocity, subject to linear steady momentum equations with linear bottom friction, can be generated by along-isobath density variations over a sloping bottom. At the same time, the density field is slowly advected by the velocity field. Away from boundary layers, the interplay is governed by Burgers' equation, which shows the formation and self-propulsion of strong density gradients along an isobath. The direction of propagation of a dense water blob is to have shallow water on the right- (left-) hand side facing downstream in the Northern (Southern) Hemisphere. The propagation of a light water blob is opposite to that of a dense water blob.

3446 **Effects of continental slope on the mean shelf circulation.** Wang, D. (Energy and Environmental Systems Division, Argonne National Laboratory, Argonne, IL 60439). *Journal of Physical Oceanography;* **12**: No. 12, 1524-1531(Dec 1982).

Csanday's (1978) theory on the mean shelf circulation in a homogeneous ocean was re-examined by including effects of a continental slope. The results suggested that the mean southwestward flow on the Mid-Atlantic Bight is driven by an inflow from the Georges Bank.

3447 **Effects of continental slope on the mean shelf circulation.** Wang, D.P. (Argonne National Lab., IL). *Journal of Physical Oceanography;* **12**: No. 12, 1524-1526(Dec 1982).

Csanady's (1978) theory on the mean shelf circulation in a homogenous ocean was re-examined by including effects of a continental slope. The results suggested that the mean southwestward flow on the Mid-Atlantic Bight is driven by an inflow from the Georges Bank.

# 64 PHYSICS RESEARCH

3448 **Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radio-frequency quadrupole-dipole fields. I. Experiment.** Wexler, S.; Parks, E.K.; Young, C.E.; Bennett, R.A. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Applied Physics;* **54**: No. 4, 1730-1754(Apr 1983). Contract W-31-109-ENG-38.

The behavior of a flowing $Cs^+$-$UF^-_6$ ion-pair plasma in the radiofrequency (rf) quadrupole-dipole fields of a mass filter has been studied experimentally. The flowing plasma was formed by collision of a beam of accelerated $UF_6$ molecules with an intense beam of thermal Cs atoms. The maximum current (positive- or negative-ion flux) entering the mass filter was $0.5 \times 10^{-3}$ A, corresponding to a positive- or negative-ion density in the injection region of $\sim 1.1 \times 10^{10}$ ions/cm$^3$. Four aspects of the interaction of the plasma with the radiofrequency fields were investigated: (1) the injection of the ion-pair plasma into the quadrupole-dipole field, (2) confinement by and transmission of the flowing plasma through a quadrupole field, (3) mass-sensitive ejection of ions from the plasma by superimposed quadrupole and dipole fields, and (4) effects of the extraction and exit fringe fields on the flowing plasma. In particular, the effects of increasing plasma density in relation to the above topics was experimentally determined. The results of the experimental observations in conjunction with the theoretical calculations discussed in the following paper suggest that the limiting-ion flux that can be confined within a quadrupole mass filter is determined by the requirement that the plasma frequency $\nu$/sub p/ must be lower than or at most equal to the applied rf quadrupole frequency $\nu_1$. If $\nu$/sub p/ $> \nu_1$, the rf field causes rapid destruction of the plasma. The mass-resolving power of the mass filter was found to deteriorate significantly with increasing plasma throughput, a result of the increasing space-charge forces within the plasma and their interaction with the applied dipole field.

## 6401 Astrophysics And Cosmology

*REFER ALSO TO CITATION(S) 3821, 3896, 3954*

3449 **(EFI—575(62)-82) Origin of low energy antiprotons in cosmic rays.** Aharonian, F.A.; Kelner, S.R.; Kotov, Yu.D. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 26p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704002.

The model of cosmic ray antiproton spectrum formation in plasma consisting mainly of $e^+$-$e^-$ pairs (nsub(+-)/nsub(p) > or approximately 10) is considered. The additional energy loss due to Coulomb collisions in plasma provides a significant increase of anti-

proton flux in the energy range < or approximately 1 GeV. The calculated anti p/p ratio is in a satisfactory agreement with the data observed.

3450 **(ITEP—80(1982)) Possible mechanism of cosmological term cancellation.** Dolgov, A.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704003.

A model is proposed in which cosmological constant is cancelled automatically because of the back reaction on it of a scalar field PHI. The cancellation takes place if two conditions are imposed on the theory, namely vanishing of mass selfinteraction of field PHI. The vacuum energy in the framework of the model considered does not disappear completely. This leads to some modification of the standard universe expansion scheme.

3451 (LA—9798-P, pp 155) **Cosmologic studies at LAMPF II: the production of cosmogenic nuclides by energetic secondary particles.** Reedy, R.C. (Los Alamos National Lab., NM); Englert, P.; Arnold, J.R. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Energetic particles, especially neutrons, in or near the beam stop of LAMPF II would simulate well the particle cascade made by galactic cosmic rays in extraterrestrial matter. These particles would be used to determine the production cross sections for radioactive and stable nuclides that are used to study the history of the cosmic rays and of meteorites and lunar samples.

3452 **(LA-UR—83-2586) Gamma-burst emission from neutron-star accretion.** Colgate, S.A.; Petschek, A.G.; Sarracino, R. (Los Alamos National Lab., NM (USA); New Mexico Inst. of Mining and Technology, Socorro (USA); National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). 30 Aug 1983. Contract W-7405-ENG-36. 8p. (CONF-8307104—4). NTIS, PC A02/MF A01. Order Number DE84001355.

From Workshop on astronomy and astrophysics; Santa Cruz, CA, USA (10 Jul 1983).

A model for emission of the hard photons of gamma bursts is presented. The model assumes accretion at nearly the Eddington limited rate onto a neutron star without magnetic a field. Initially soft photons are heated as they are compressed between the accreting matter and the star. A large electric field due to relatively small charge separation is required to drag electrons into the star with the nuclei against the flux of photons leaking out through the accreting matter. The photon number is not increased substantially by bremsstrahlung or any other process. Instability in an accretion disc might provide the infalling matter required.

3453 **(LA-UR—83-2681) Joint timing analysis of A0535 + 26 at 1980 outburst.** Kawai, N.; Nagase, F. (Los Alamos National Lab., NM (USA); Nagoya Univ. (Japan). Dept. of Astrophysics). 1983. Contract W-7405-ENG-36. 5p. (CONF-8307104—1). NTIS, PC A02/MF A01. Order Number DE84001320.

From Workshop on astronomy and astrophysics; Santa Cruz, CA, USA (10 Jul 1983).

The pulse-timing data of A0535 + 26, obtained by the Hakucho satellite in October 1980 is analyzed taking into consideration other observations. The results show that a considerable fraction of the observed period change is intrinsic.

3454 **(LA-UR—83-2776) Log N-log S is inconclusive.** Klebesadel, R.W.; Fenimore, E.E.; Laros, J. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 6p. (CONF-8307104—3). NTIS, PC A02/MF A01. Order Number DE84001301.

From Workshop on astronomy and astrophysics; Santa Cruz, CA, USA (10 Jul 1983).

The log N-log S data acquired by the Pioneer Venus Orbiter Gamma Burst Detector (PVO) are presented and compared to similar data from the Soviet KONUS experiment. Although the PVO data are consistent with and suggestive of a -3/2 power law distribution, the results are not adequate at this state of observations to differentiate between a -3/2 and a -1 power law slope.

3455 **(LA-UR—83-2777) Ten years of Vela x-ray observations.** Terrell, J.; Priedhorsky, W.C. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-8307104—2). NTIS, PC A02/MF A01. Order Number DE84001302.

From Workshop on astronomy and astrophysics; Santa Cruz, CA, USA (10 Jul 1983).

Portions are illegible in microfiche products.

The Vela spacecraft, particularly Vela 5B, produced all-sky X-ray data of unprecedented length and completeness. The data led to the discovery of X-ray bursts and numerous transient outbursts. Recent re-analysis has put the data in the form of 10-day skymaps covering a 7-year period, which have led to the discovery or confirmation of a number of long-term periodicities, and have made possible a time-lapse movie of the X-ray sky.

3456 **(LA-UR—83-2887) Energy distributions and yields of secondary ions and electrons emitted by GIOTTO during Halley encounter.** Young, D.T. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 9p. (CONF-8309176—1). NTIS, PC A02/MF A01. Order Number DE84001661.

From 17. ESLAB symposium on spacecraft-plasma interactions and their influence on field and particle measurements; Novrdwijk, Netherlands (1 Sep 1983).

Portions are illegible in microfiche products.

The extreme ram velocity of the GIOTTO space-craft with respect to the Halley environment will produce a host of surface impact phenomena not previously encountered by planetary spacecraft. This paper extends earlier efforts to model impact produced plasma at GIOTTO by investigating published data on secondary electron and ion energy distributions, including the effect of possible surface contamination. One new result, is the finding that the threshold velocity for kinetic emission of secondary electrons by neutral gas is very nearly equal to the GIOTTO ram velocity. This makes it difficult to predict electron yields due to neutral gas impact.

3457 **(LA-UR—83-2896) Numerical simulations of convectively excited gravity waves.** Glatzmaier, G.A. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 11p. (CONF-8308136—1). NTIS, PC A02/MF A01. Order Number DE84001867.

From Solar seismology from space conference; Snowmass, CO, USA (17 Sep 1983).

Magneto-convection and gravity waves are numerically simulated with a nonlinear, three-dimensional, time-dependent model of a stratified, rotating, spherical fluid shell heated from below. A Solar-like reference state is specified while global velocity, magnetic field, and thermodynamic perturbations are computed from the anelastic magnetohydrodynamic equations. Convective overshooting from the upper (superadiabatic) part of the shell excites gravity waves in the lower (subadiabatic) part. Due to differential rotation and Coriolis forces, convective cell patterns propagate eastward with a latitudinally dependent phase velocity. The structure of the excited wave motions in the stable region is more time-dependent than that of the convective motions above. The magnetic field tends to be concentrated over giant-cell downdrafts in the convective zone but is affected very little by the wave motion in the stable region.

3458 **(LA-UR—83-2901) Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds.** Becker, S.A.; Mathews, G.J.; Brunish, W.M. (Lawrence Livermore National Lab., CA (USA); Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. NTIS, PC A02/MF A01. Order Number DE84001870.

Young star clusters (< $3 \times 10^8$ yr) in the Magellanic Clouds (MC) can be used to test the current status of the theory of stellar evolution as applied to intermediate and massive stars. The color-magnitude diagram of many young clusters in the MC shows, unlike the case of clusters in our Galaxy, large numbers of stars in

both the main sequence and post main sequence evolutionary phases. Using a grid of stellar evolution models, synthetic cluster H-R diagrams are constructed and compared to observed color-magnitude diagrams to determine the age, age spread, and composition for any given cluster. In addition, for those cases where the data is of high quality, detailed comparisons between theory and observation can provide a diagnostic of the accuracy of the stellar evolution models. Initial indications of these comparisons suggest that the theoretical models should be altered to include: a larger value for the mixing length parameter ($\alpha$), a larger rate of mass loss during the asymptotic giant branch (AGB) phase, and possibly convective overshoot during the core burning phases.

3459 **(N—8326441) Prediction and identification of cosmic solar radiation flux and spectra.** Avdyushin, S.I.; Pereyaslova, N.K.; Svidskiy, P.M.; Malyshev, A.B. (Joint Publications Research Service, Arlington, VA (USA)). May 1983. 7p. NTIS, PC A 07.

As a result of investigating the link between characteristics of cosmic solar radiation events and parameters of heliogeophysical phenomena that accompany a solar burst, several patterns were established, which served as the basis of forecasting methods. The method of concurrent examination of the set of heliogeophysical phenomena associated with a solar burst is used to solve forecasting problems. The data about solar activity, flux of penetrating radiation in the interplanetary environment and magnetosphere, as well as about the state of the interplanetary environment, which are needed for analysis, are provided by cosmic, stratospheric and ground-based equipment, which forms a regulation observation network of the radiation situation service.

3460 **(N—8326775) Using solar radio burst integrated fluxes to predict energetic proton flux increases.** Barron, W.R. (Air Force Geophysics Lab., Hanscom AFB, MA (USA)). Aug 1982. 34p. (AD-A—126329; AFGL-TR—82-0253). NTIS, PC A03/MF A01.

Time integrated solar radio fluxes and their association with satellite observed solar energetic proton flux increases were studied. The time integration was only of the U portion of the radio burst flux increase. The best correlations between the integrated radio fluxes and the proton peak fluxes were realized when the radio fluxes were multiplied by the factor exp (-3B), where B is the angular distance, in radians, between the site of the flare and the solar footpoint of the magnetic field connection between the Sun and the Earth. The solar footpoint positions were determined from the solar wind speed. Two variate linear regressions were computed using the time integrated radio fluxes at five discrete radio frequencies in the 606 to 8800 MHz frequency interval and peak proton fluxes at 10 MeV and 30 MeV. Three variate and four variate linear regressions using different configurations of the time integrated radio fluxes were also computed. The best of all the correlations was found with the four variate regression of the three highest frequencies and the 30 MeV proton flux.

3461 **(N—8326780) Implications of HEAO-3 data for the acceleration and propagation of galactic cosmic rays.** Ormes, J.F.; Protheroe, R.J. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jan 1983. 35p. (NASA-TM—84964). NTIS, PC A03/MF A01.

The energy dependence of the mean escape length of cosmic rays from the galaxy in the light of recent measurements of cosmic ray abundances from the Danish-French experiment on HEAO-3 is re-examined. The energy dependence is found to be steeper than previously thought.

3462 **(N—8327928) NASA/Goddard Space Flight Center contributions to the Workshop on Positron-Electron Pairs in Astrophysics.** Ramaty, R. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 62p. (NASA-TM—85027). NTIS, PC A04/MF A01.

Topics addressed include positron-electron pair production and annihilation phenomena in various astrophysical sources including galaxies and galactic nuclei, neutron stars, and cosmic background radiation.

3463 **(N—8327929) An electron-positron jet model for the galactic center.** Burns, M.L. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

High energy observations of the galactic center on the subparsec scale seem to be consistent with electron-positron production in the form of relativistic jets. These jets could be produced by an approximately 1,000,000 solar mass black hole dynamo transportating pairs away from the massive core. An electromagnetic cascade shower would develop first from ambient soft protons and then, nonlinearly, the shower using itself as a scattering medium. This is suited to producing, cooling and transporting pairs to the observed annihilation region. It is possible that the center of our galaxy is a miniature version of a more powerful active galactic nuclei that exhibits jet activity.

3464 **(N—8327930) Comparison of photon-photon and photon-magnetic field pair production rates.** Burns, M.L. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

Neutron stars were proposed as the site of gamma-ray burst activity and the copious supply of MeV photons admits the possibility of electron-positron pair production. If the neutron star magnetic field is sufficiently intense ( 10 to the 12th power G), both photon-photon (2 gamma) and photon-magnetic field ( gamma) pair production should be important mechanisms. Rates for the two processes were calculated using a Maxwellian distribution for the photons. The ratio of 1 gamma to 2 gamma pair production rates was obtained as a function of photon temperature and magnetic field strength.

3465 **(N—8327931) Pair production and annihilation in strong magnetic fields.** Daugherty, J.K.; Harding, A.K. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 13p. NTIS, PC A04/MF A01.

Electromagnetic phenomena occurring in the presence of strong magnetic fields are currently of great interest in high-energy astrophysics. In particular, the process of pair production by single photons in the presence of fields of an order of 10 to the 12th power Gauss is of importance in cascade models of pulsar gamma ray emission, and may also become significant in theories of other radiation phenomena whose sources may be neutron stars (e.g., gamma ray bursts). In addition to pair production, the inverse process of pair annihilation is greatly affected by the presence of superstrong magnetic fields. The most significant departures from annihilation processes in free space are a reduction in the total rate for annihilation into two photons, a broadening of the familiar 511-keV line for annihilation at rest, and the possibility for annihilation into a single photon (which dominates the two-photon annihilation for B ( 10 the 13th power Gauss). The physics of these pair conversion processes, which is reviewed briefly, can become quite complex in the teragauss regime, and can involve calculations which are technically difficult to incorporate into models of emission mechanisms in neutron star magnetospheres. However, theoretical work, especially in the case of pair annihilation, also suggests potential techniques for more direct measurements of field strengths near the stellar surface.

3466 **(N—8327932) Low-temperature positron annihilation.** Drachman, R.J. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 11p. NTIS, PC A04/MF A01.

For a satisfactory understanding of astrophysical annihilation radiation, especially that observed from the galactic center direction, the interaction of positrons with the ambient medium must be carefully investigated. Although hot, ionized regions may be important sources of annihilation radiation, the simpler processes occurring in low-temperature neutral hydrogen gas are mainly addressed. The goal is to set limits on conditions in the annihilation region by using the predictions of atomic theory compared with the observed gamma-ray line width, continuum strength and time dependence.

3467 **(N—8327933) Upper limits to the annihilation radiation luminosity of Centaurus A.** Gehrels, N.; Cline, T.L. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

A high resolution observation of the active nucleus galaxy Centaurus A (NGC 5128) was made by the GSFC low energy gamma-ray spectrometer (LEGS) during a balloon flight on 19 November 1981. The measured spectrum between 70 and 500 keV is well represented by a power law of the form 1.05 x 10 (-4) (E/100 keV) (-1.59) ph/sq cm /s with no breaks or line features observed. The 98% confidence (2 sigma) flux upper limit for a narrow ( 3 keV) 511-keV positron annihilation line is 9.9 x 10 (-4) ph/ sq cm / s. Using this upper limit, the ratio of the narrow-line annihilation radiation luminosity to the integral or 511 keV luminosity is estimated to be 0.09 (2 sigma upper limit). This is compared with the measured value for our galactic center in the Fall of 1979 of 0.10 to 0.13, indicating a difference in the emission regions in the nuclei of the two galaxies.

3468 **(N—8327934) Pair production near threshold in pulsar magnetic fields.** Harding, A.K.; Daugherty, J.K. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

In pulsar polar cap models, curvature radiation gamma rays produce e(+)e(-) pairs in the strong magnetic fields near the surface of the neutron star. While these gamma rays have energies E sub gamma mc(2), they also propagate at very small angles to the fields, such that the threshold condition, E gamma 2mc(2)/sin theta is just barely satisfied when they pair produce. Threshold effects on the pair production attenuation coefficient, which are due to the discreteness of the e(+)e(-) Landau states, must therefore be considered when computing the mean free paths of curvature radiation photons in pulsar magnetic fields. These effects, which are not incorporated in the asymptotic expression for the attenuation coefficient, have some interesting consequences for pulsar models. Since pair production is suppressed near the threshold, the photon mean free paths are longer than previously thought. In magnetic fields approximately 6x10 G, the pairs tend to be produced in the ground state Landau level and will not synchrotron radiate. Since synchrotron radiation is an essential ingredient in the electromagnetic cascades which produce low energy pairs above the acceleration region, pulsars with very high magnetic fields may not produce many pairs.

3469 **(N—8327935) Electron-positron annihilation and the cosmic X-ray background.** Kazanas, D.; Shafer, R.A. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

The possibility that the processes responsible for the cosmic X-ray background (CXB) would also produce an e(-)-e(+) annihilation feature is examined. Under the assumption that these proesses are thermal, the absence of a strong e(-)-e( ) annihilation feature places constraints on the compactness (L/R ratio) of these sources. Observations favor souces of small compactness ratio.

3470 **(N—8327936) The origin of the galactic annihilation radiation.** Lingenfelter, R.E.; Ramaty, R. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 6p. NTIS, PC A04/MF A01.

Observations of the e(+)-e(-) annihilation radiation from the galactic center are reviewed and the implications of these and other observations on the positron production process, the annihilation region and the fundamental nature of the galactic center source are discussed.

3471 **(N—8327937) Criteria for grasar action in astrophysical sources.** McKinley, J.M.; Ramaty, R. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 5p. NTIS, PC A04/MF A01.

The theory of gamma ray amplification through stimulated annihilation radiation (grasar) was developed by Ramaty, McKinley and Jones. For gamma ray bursts similar to the March 5, 1979 burst, an observed annihilation line of width 0.03 MeV would imply a grasar source. The minimum pair density needed for the onset of grasar action is approx. 10 to the 30th power/cu cm and the peak of the grasar line, without a gravitational redshift, is at 0.5 MeV.

3472 **(N—8327945) Gamma-gun in the center of the galaxy.** Kardashev, N.S.; Novikov, I.D.; Polnarev, A.G.; Stern, B.E. (AN SSSR, Moscow). 1982. 35p. (REPT—757). AN SSSR, Moscow.

The annihilation line and the continuous spectrum over the range of energies of more than 100 KeV may result from the interaction of a directed gamma-quanta beam (with a characteristic energy of approx. 100 MeV), formed near a massive black hole (some kind of a 'gamma gun'), and the gaseous matter of the cloud/target. The results of similar calculations of such interaction are given.

3473 **(N—8327948) Persistent 1.5s oscillations superimposed at a solar burst observed at two mm-wavelengths.** Zodi, A.M.; Kaufmann, P.; Zirin, H. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). May 1983. 31p. (INPE—2737-PRE/317). NTIS, PC A03/MF A01.

Long-enduring quasi-periodic oscillations (1.5s) superimposed to a solar burst were observed simultaneously at two different mm-wavelengths (22 GHz and 44 GHz). The oscillations were present throughout the burst duration (about 10 min), and were delayed at 44 GHz with respect to 22 GHz by 0.3s. The relative amplitude of the oscillation was about 20 percent at 44 GHz and about 5 percent at 22 GHz. Interferometer measurements at 10.6 GHz indicated that the burst source was stable within 1 arcsec. The HeD3 line flare indicated two persistent small spots separated by about 10 arcsec. The 22/44 GHz burst position has good correspondence with the HeD3 spots' location. The oscillations displayed features which apprear to distinguish them from ultrafast time structures found in other bursts. One possible interpretation was suggested by assuming a modulation of the gyrosynchrotron emission of trapped electrons by a variable magnetic field on a double burst source, optically thin at 44 GHz and with an optical thickness of approximately 0.3 at 22 GHz.

3474 **(TRITA-EPP—82-04) Paradigm transition in cosmic plasma physics.** Alfven, H. (Royal Inst. of Tech., Stockholm (Sweden). Electron and Plasma Physics). Jun 1982. 43p. (CONF-820618—14). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704000.

From International conference on plasma physics; Goeteborg, Sweden (7 Jun 1982).

In situ measurements in the magnetospheres together with general advancement in plasma physics are now necessitating introduction of a number of effects that have been recently discovered or earlier neglected. Examples are: 1) Electric double layers (like in the lower magnetosphere) 2) Thin current layer (like in the magnetopause) giving space a cellular structure. 3) Current produced filaments (e.g. in prominences, solar corona and interstellar clouds). 4) Further it is important to use the electric current (particle) description and to study the whole circuit in which the current flows. 5) The pinch effect cannot be neglected as is now usually done. 6) The critical velocity phenomenon is essential, for example for the band structure of solar systems. 7) Theory of dusty plasmas is important. The result is a change in so many theories in cosmic plasma physics that it is appropriate to speak of an introduction of a new paradigm. This should be based on empirical knowledge from magnetospheric and laboratory investigations. Its application to astrophysics in general, including cosmology, will necessarily lead to a revision of e.g. the present theories of the formation of stars, planets and satellites. It is doubtful whether the big bang cosmology will survive.

3475 **Formation of comets by radiation pressure in the outer protosun. II. Dependence on the radiation-grain coupling.** Hills, J.G.; Sandford, M.T. II. (Theoretical Division, T-6, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Astronomical Journal;* **88**: No. 10, 1519-1521(Oct 1983).

Radiation pressure from the protosun and neighboring protostars may have caused the formation of the comets. Grains feel a net radiation pressure toward the center of the protocomet dust cloud due to the absorption and backscattering of radiation by the dust. Mie scattering is used to estimate the dust-radiation coupling. The dust-radiation coupling is sufficiently strong that the comets can form within the free fall time of the outer protosun.

3476 **Formation of comets by radiation pressure in the outer protosun. III. Dependence on the anisotropy of the radiation field.** Hills, J.G.; Sandford, M.T. Jr. (Theoretical Division, T-6, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Astronomical Journal;* **88**: No. 10, 1522-1530(Oct 1983).

A two-dimensional, radiation-hydrodynamic code with dust was used to study the effect of an anisotropic radiation field on the formation of comets in the outer protosun by the radiation pressure from the Sun and surrounding protostars. If the radiation field is isotropic, the results are very similar to those found earlier by analytic models. When the dust cloud is flanked on two sides by luminous walls of equal strength but with no radiation entering the cloud from the azimuthal direction (a radiation vise), most of the dust eventually squeezes out the sides of the vise. The sides are open to outward streaming radiation which carries the dust with it. However, the entrance of even a small amount of radiation from the sides causes the dust to drift inward to form the comet. The work given in this paper indicates that a highly anisotropic radiation field is not likely to prevent the formation of a comet. It distorts the shape of the inward drifting dust cloud. Initially, faster inward drift occurs along radii having the strongest inward radiation flux. This in turn causes the optical depth to increase faster along the perpendicular radii where the radiation field is the weakest. The increase in the optical depth eventually compensates for the low radiation flux, so as the cloud shrinks the radiation pressure increases faster at the surface of the cloud along those radius vectors where the radiation flux has a minimum. Although the dust cloud in the anisotropic radiation field attains a very irregular shape, eventually all parts of the cloud contract in unison and arrive at the center of the cloud at about the same time.

3477 **Low-frequency measurement of the spectrum of the cosmic background radiation.** Smoot, G.F.; De Amici, G.; Friedman, S.D.; Witebsky, C.; Mandolesi, N.; Partridge, R.B.; Sironi, G.; Danese, L.; De Zotti, G. (Space Sciences Laboratory and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 12, 1099-1102(19 Sep 1983). Contract AC03-76SF00098.

Measurements have been made of the cosmic-background-radiation spectrum at five wavelengths (0.33, 0.9, 3, 6.3, and 12 cm) with use of radiometers with wavelength-scaled corrugated-horn antennas having very low sidelobes. A single large-mouth (0.7-m-diam) liquid-helium—cooled absolute reference load was used for all five radiometers. The results of the observations are consistent with previous measurements and represent a significant improvement in accuracy at low frequencies.

3478 **Problems with the new inflationary universe.** Breit, J.D.; Gupta, S.; Zaks, A. (The Institute for Advanced Study, Princeton, New Jersey 08540). *Physical Review Letters;* **51**: No. 11, 1007-1009(12 Sep 1983). Contract AC02-76ER02220.

It is demonstrated that in the new-inflationary-universe scenario based on a Coleman-Weinberg—type potential all the bubbles evolve through the SU(4)xU(1) local minimum. The transition from this local minimum to the SU(3)xSU(2)xU(1) global minimum is first order, and so the scenario does not solve all of the cosmological problems.

3479 **Entropy from extra dimensions.** Alvarez, E.; Belen Gavela, M. (Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138). *Physical Review Letters;* **51**: No. 10, 931-934(5 Sep 1983). Contract AC02-76ER03230.

The phenomenon of "dynamical compactification" in a universe with 4+n/sub c/ dimensions is studied, and it is found that if the whole process is adiabatic, entropy is pumped into the effective four-dimensional universe. Some cosmological consequences of this fact are discussed.

3480 **Rate of the $^3$He(p, e$^+$ $\nu$)$^4$He reaction.** Tegner, P.E.; Bargholtz, C. (Department of Physics, University of Stockholm). *Astrophysical Journal;* **272**: No. 1, 311-316(1 Sep 1983). Contract AC02-76ER13001.

The p+$^3$He reaction rate is calculated by comparing the matrix element to the matrix element for thermal neutron capture. Meson exchange contributions amount to approximately 20%. We predict a cross section factor S(E/sub p/ = 0) between 4 and 25 x $10^{-20}$ keV barns and an upper limit to the corresponding neutrino capture rate in $^{37}$Cl and $^{71}$Ga of 0.1 and 0.03 SNU, respectively.

3481 **Collisional modification to the exospheric theory of solar wind halo electron pitch angle distributions.** Lemons, D.S.; Feldman, W.C. (Los Alamos National Laboratory). *Journal of Geophysical Research;* **88**: No. A9, 6881-6888(1 Sep 1983).

A theoretical model of suprathermal halo or strahl solar wind electrons, including both binary collisions and conservative force fields, is proposed. From this model we derive the collisionally modified electron pitch angle distribution and compare it with relevant measurements made in the solar wind at 1 AU by using the Los Alamos IMP 8 plasma analyzer. Although the collisionally modified distribution is more isotropic than that predicted by simple exospheric theory, it is not isotropic enough to describe the measurements.

3482 **Arrow of electromagnetic time and the generalized absorber theory.** Cramer, J.G. (Department of Physics, FM-15, University of Washington, Seattle, Washington 98195). *Foundations of Physics;* **13**: No. 9, 887-902(Sep 1983).

The problem of the direction of electromagnetic time, i.e., the complete dominance of retarded electromagnetic radiation over advanced radiation in the universe, is considered in the context of a generalized form of the Wheeler—Feynman absorber theory in an open expanding universe with a singularity at T = 0. It is shown that the application of a four-vector reflection boundary condition at the singularity leads to the observed dominance of retarded radiation; it also clarifies the role of advanced and retarded waves in the emission of very weakly absorbed radiation such as neutrinos.

3483 **Analysis of the Konus catalog of gamma-ray bursts with the thermal synchrotron model.** Liang, E.P.; Jernigan, T.E.; Rodrigues, R. (Lawrence Livermore National Laboratory, University of California; and Institute for Plasma Research, Stanford University). *Astrophysical Journal;* **267**: No. 2, 766-777(15 Aug 1983). Contract W-7405-ENG-48.

We analyze the approximately 150 reported $\gamma$-ray burst spectra of the Konus catalog using the thermal synchrotron model. An overwhelming majority of these spectra can be satisfactorily fitted by theoretical thermal synchrotron spectra of mildly relativistic electrons in strong magnetic fields, making the strong-field neutron star picture at least self-consistent. Valuable additional information is also extracted from various spectral features contained in many of the events.

3484 **Nonlinear evolution of large-scale structure in the universe.** Frenk, C.S.; White, S.D.M.; Davis, M. (University of California, Berkeley). *Astrophysical Journal;* **267**: No. 2, 417-430(15 Aug 1983).

Using N-body simulations we study the nonlinear development of primordial density perturbation in an Einstein—de Sitter universe. We compare the evolution of an initial distribution without small-scale density fluctuations to evolution from a random Poisson distribution. These initial conditions mimic the assumptions

of the adiabatic and isothermal theories of galaxy formation. The large-scale structures which form in the two cases are markedly dissimilar. In particular, the correlation function ξ(r) and the visual appearance of our adiabatic (or "pancake") models match better the observed distribution of galaxies. This distribution is characterized by large-scale filamentary structure. Because the pancake models do not evolve in a self-similar fashion, the slope of ξ(r) steepens with time; as a result there is a unique epoch at which these models fit the galaxy observations. We find the ratio of cutoff length to correlation length at this time to be λ/sub min//$\tau_0$ = 5.1; its expected value in a neutrino dominated universe is $4(\Omega h)^{-1}$ ($H_0$ = 100h km $s^{-1}$ $Mpc^{-1}$). At early epochs these models predict a negligible amplitude for ξ(r) and could explain the lack of measurable clustering in the Lyα absorption lines of high-redshift quasars. However, large-scale structure in our models collapses after z = 2. If this collapse precedes galaxy formation as in the usual pancake theory, galaxies formed uncomfortably recently. The extent of this problem may depend on the cosmological model used; the present series of experiments should be extended in the future to include models with Ω<1.

3485 **Neutron capture rates in the r-process: the role of direct radiative capture[1].** Matthews, G.J.; Mengoni, A.; Thielemann, F.; Fowler, W.A. (University of California, Lawrence Livermore National Laboratory). *Astrophysical Journal;* **270**: No. 2, 740-745(15 Jul 1983).

The nuclear physics associated with neutron capture along the r-process path is reviewed, and it is noted that the usual statistical assumptions for the capture rates may not be valid. A comparison with statistical model calculations reveals that direct radiative capture may be the dominant reaction mechanism in the vicinity of and beyond the r-process path. The fact that the direct radiative capture mechanism represents a firm lower to the nuclear cross section is used to infer an upper limit of 1.5 x $10^{20}$ $cm^{-3}$ for the critical neutron density necessary to guarantee (n,Y) equilibrium in the r-process.

3486 **Correlation functions in a filamentary clustering prescription.** Fry, J.N. (Astronomy and Astrophysics Center, University of Chicago). *Astrophysical Journal, Letters to the Editor;* **270**: No. 2, L31-L33(15 Jul 1983). Contract AC02-80ER10773.

Two simple clustering prescriptions have provided useful comparisons for studies of the properties of the large-scale galaxy distribution: the power-law cluster model and the continuous hierarchy model. I propose another simple paradigm, inherently "filamentary," whose correlation functions scale with size in a way indistinguishable at present from those of the continuous hierarchy. There exists a growing body of observational evidence for filaments.

3487 **Correlated x-ray and optical time variability of TT arietis.** Jensen, K.A.; Cordova, F.A.; Middleditch, J.; Mason, K.O.; Grauer, A.D.; Horne, K.; Gomer, R. (University of California, Los Alamos National Laboratory). *Astrophysical Journal;* **270**: No. 1, 211-225(1 Jul 1983).

Simultaneous X-ray and optical photometry of the cataclysmic variable TT Arietis has revealed correlated X-ray and opticl variability over a broad range of time scales. Large amplitude X-ray flickering with a time scale of ~1000 s persists for the entire observation, is present at all orbital phases, and is correlated with optical flickering. The X-ray flickering is delayed by ~1 minute with respect to the optical flickering. Transient hard X-ray oscillations with periods ~32 s, ~12 s, and ~9 s and transient optical oscillations with periods ~32 s and ~12 s are observed. There is a modulation of the X-ray flux with a period consistent with the orbital period of approximately 200 minutes, but there is no apparent modulation of the X-ray spectrum. The optical flux is modulated with a similar period and may lag the X-ray modulation by ~0.1 in phase. An X-ray photoelectric absorption event with a duration of about 1000 s is observed. An optical flux decrease of shorter duration (~500 s) occurs at the same time. The X-ray spectrum is well fitted by a thermal bremsstrahlung plus Gaunt factor model with kT> or ≈10 keV, N/sub H/ = 1-2 x $10^{21}$ $cm^{-2}$, and a received flux of ~2 x $10^{-11}$ ergs $cm^{-2}$ $s^{-1}$ between 0.2 and 4 keV. The results of our observations suggest that the hard X-ray emission from TT Ari may be produced in a corona above and below the inner accretion disk.

3488 **Evidence for an ~300 day period in Cygnus X-1.** Priedhorsky, W.C.; Terrell, J.; Holt, S.S. (Earth and Space Sciences Division, Los Alamos National Laboratory). *Astrophysical Journal;* **270**: No. 1, 233-238(1 Jul 1983).

We present the time history of X-ray emission from Cyg X-1 over an 11 year period, with 10 day resolution. The data were obtained by experiments on the Vela 5B (1969—1979) and Ariel 5 (1974—1980) satellites. Cyg X-1 varies by ~25% with a 294 +- 4 day period. This modulation is apparently unrelated to the known transitions between the source high and low states. Flux minima occur at 1974.05+nP. The observed period is within the possible range for the precession period of an accretion disk, or of the companion star HDE 226868, in the Cyg X-1 system.

3489 **Survey of the core helium flash with dynamic convection.** Deupree, R.G.; Cole, P.W. (Los Alamos National Laboratory). *Astrophysical Journal;* **269**: No. 2, 676-685(15 Jun 1983).

Calculations have been performed to study the dependence on model parameters of convectively heating the region interior to the core convection zone for core helium flash models. We find that interior heating always occurs on a time scale significantly shorter than the evolutionary time scale even at the peak of the flash.

3490 **Nucleosynthesis of $^{26}$Al at low stellar temperatures.** Champagne, A.E.; Howard, A.J.; Parker, P.D. (A. W. Wright Nuclear Structure Laboratory, Yale University). *Astrophysical Journal;* **269**: No. 2, 686-689(15 Jun 1983).

Recent nuclear reaction studies on $^{26}$Al have established the existence of a previously unobserved s-wave resonance in the $^{25}$Mg+p system at E/sub cm/ = 37.2 keV and a possible resonance at E/sub cm/ = = 94.0 keV. The $^{25}$Mg(p, γ)$^{26}$Al reaction rate has been calculated for temperatures characteristic of both nonexplosive and explosive hydrogen burning, and the astrophysical consequences of the 37.2 keV and 94.0 keV resonances are discussed; it is demonstrated that the contributions of these resonances increase the reaction rate by 10 orders of magnitude at stellar temperatures near $T_9$ = 0.04.

3491 **Decay of long-lived particles in the early universe.** Silk, J.; Stebbins, A. (Department of Astronomy, University of California, Berkeley). *Astrophysical Journal;* **269**: No. 1, 1-12(1 Jun 1983).

Radiative decay of massive fermions can distort the cosmic background radiation. Constraints are derived on the masses and lifetimes of such particles which decoupled when the effective number of species in equilibrium was large (~50). These have specific significance for particles predicted by supersymmetry theories and for right-handed neutrinos. We show that particles of mass m/sub f/ with lifetime tau<50 (1+75 eV/m/sub f/ )$^{-1}$/sup //$^{2}$ yr, which had density less than the photon density, are allowable because of photon thermalization, and that decay photons for particles such that m/sub f/ tau$^{2}$/sup //$^{3}$roughly-equal$10^{4}$ eV yr$^{2}$/sup //$^{3}$ are hidden in the peak of the interstellar background radiation. Implications for galaxy formation theory are also noted.

3492 **Cosmological effects of primeval fermion degeneracy in the grand unified theories.** Fry, J.N.; Hogan, C.J. (Institute of Astronomy, University of Cambridge, Cambridge CB30HE, United Kingdom and Astronomy and Astrophysics Center, Enrico Fermi Institute, The University of Chicago, Chicago, Illinois 60637). *Physical Review Letters;* **49**: No. 25, 1873-1876(20 Dec 1982). Contract AC02-80ER10773.

Generalized grand unified big-bang models which include initial fermion degeneracies are considered, and limits are obtained on specific entropy and lepton number valid for any theory which contains SU(5). Lepton degeneracies may occur which significantly affect element production. These results affect inferences about the early universe based on the standard model.

**3493 Collapse of iron stellar cores.** Bowers, R.; Wilson, J.R. (Lawrence Livermore National Laboratory). *Astrophysical Journal;* **263**: No. 1, 366-376(1 Dec 1982).

The collapse of the iron core of evolved 10, 15, and 20 M/ sub sun/ stars has been calculated using a spherically symmetric numerical model. No bounce occurs and no matter is ejected. Sensitivity to some less well-established details, and to zoning, has been examined and the overall qualitative results are unchanged. A black hole is the presumed outcome of the model.

**3494 Four-point function in the BBGKY hierarchy.** Fry, J.N. (Astronomy and Astrophysics Center, Enrico Fermi Institute, University of Chicago). *Astrophysical Journal;* **262**: No. 2, 424-431(15 Nov 1982). Contract AC02-80ER10773.

Higher order galaxy correlation functions follow a hierarchical pattern, but the amplitude coefficients Q, R/sub a/, and R/sub b/ are freely adjustable, even within the completely hierarchical picture. I derive in the BBGKY hierarchy the relation R/sub a/ = R/sub b/ = $2Q^2/3$ and compare this result with other previously derived relations and with data from the Lick and Zwicky galaxy catalogs.

**3495 Thick accretion disks around black holes.** Paczynski, B. pp 27-44 of Review lectures IV. Report on the scientific conference in Strasbourg, February 24-26, 1982. Hamburg, Germany; Astronomische Gesellschaft (1982). (CONF-8109234—No.57).

From International meeting on relativistic astrophysics, origins and evolution of the solar system and late states of solar evolution; Innsbruck, Austria (15 Sep 1981).

Partially presented at the International Astronomical Conference in Innsbruck 1981.

Theory of thick low viscosity disks accreting onto black holes is reviewed. Usefulness of a simplified pseudo-Newtonian potential for studies of disk models is emphasized. It is shown how very high accretion rate leads to a large disk thickness, large pressure gradients in the radial direction, formation of a narrow open funnel around the rotation axis, and a decrease of efficiency of convertion of rest mass into radiation. It is possible that the well collimated powerful radiation beam emerging from the funnel may accelerate some gas to moderately relativistic velocity in a form of a twin jet. The process is not efficient if the funnel is optically thin, but it is hoped that large optical depth of gas in the funnel may increase the fraction of total power coming out as kinetic energy of the jet. This class of models may be applied to SS 433, and possibly to other compact X-ray sources like Sco X-1 and Cyg X-1. These models may be relevant to some active galactic nuclei, but their relatively low efficiency in converting mass to radiation and kinetic energy does not permit too universal application.

**3496 Activity in the centers of galaxies.** Kundt, W. (Bonn Univ. (Germany, F.R.). Inst. fuer Astrophysik und Extraterrestrische Forschung). pp 65-78 of Review lectures IV. Report on the scientific conference in Strasbourg, February 24-26, 1982. Hamburg, Germany, F.R.; Astronomische Gesellschaft (1982). (CONF-8109234—No.57).

From International meeting on relativistic astrophysics, origins and evolution of the solar system and late states of solar evolution; Innsbruck, Austria (15 Sep 1981).

Partially presented at the International Astronomical Conference in Innsbruck 1981.

This report will be one about superlatives: It concerns itself with the largest, most powerful phenomena in the Universe ranging through more than 11 orders of magnitude in linear extent - from 10 a.u. to 10 Mpc - and through 20 orders of magnitude in observed frequency - from radio frequencies to γ-ray and even cosmic ray energies. It will address the 20-year-old riddle of the quasars as well as the blazars, radio-galaxies, the Seyfert-phenomenon, and the central activity in more normal galaxies. Despite a spread in radiated power by more than a factor of $10^{10}$ from the strongest ($10^{48}$ erg ssup(-1)) to the weakest, all these phenomena show similar morphologies, spectra, velocities, variabilities and source sizes, suggesting that the same type of engine is at work. This engine is often $10^3$ times more luminous than its mother galaxy whereas its volume is some $10^{24}$ times smaller. The similarity of phenomena even extends down in scale to our Galactic center and further to the binary radio and X-ray stars Sco X-1 and SS 433 whose engines are probably magnetized neutron stars.

**3497 Review lectures IV. Report on the scientific conference in Strasbourg, February 24-26, 1982.** Hamburg, Germany, F.R.; Astronomische Gasellechaft (1982). vp. (CONF-8109234—No.57). Fachinformationszantrum Energie, Physik, Mathematik, Karlsruhe Germany, F.R.

From International meeting on relativistic astrophysics, origins and evolution of the solar system and late states of solar evolution; Innsbruck, Austria (15 Sep 1981).

The papers presented were entered into the data base separately. (EHK)

## 6402 Atmospheric Physics

**3498 (AD-A—130168/8) Sources of surface magnetic field variability. Final report.** Olson, W.P. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). 28 Apr 1983. 44p. NTIS, PC A03/MF A01.

The contribution of non-ionospheric currents to the quiet daily variation in the earth's surface magnetic field (the sub Sq variation) is being reexamined. It has been found that the direct use of magnetospheric magnetic field models to represent the contribution of these currents to the surface field produces large errors. Thus direct integration over the currents was used. The induction problem was addressed and the contribution to sub Sq from currents induced in the earth's crust was determined. The total day to night contribution to sub Sq was found to be a minimum of 12 nanotesla. This contrasts with a measured variation of from 20 to 45 nanotesla. Thus the magnetospheric currents produce from about 1/4 to over 1/2 of the observed pattern. The Birkeland currents also contribute to sub Sq at sub-auroral latitudes. A study was initiated to examine the day to day variability in sub Sq using ground based magnetometer data and direct (satellite observations) of the solar wind. A means for experimentally determining the baseline for sub Sq (and the main field) was developed.

**3499 (AD-A—130930/1) Morphology of plasma density irregularities in the auroral f-region. Technical report.** Vickrey, J.F. (SRI International, Menlo Park, CA (USA)). 1 Apr 1982. 36p. NTIS, PC A03/MF A01.

In this report a framework for understanding the morphology of high latitude plasma density irregularities is developed that has three component parts. namely, to predict irregularity morphology one must specify (1) the source of irregularities, (2) the lifetimes of irregularities once produced, and (3) the redistribution of irregularities by magnetospheric convection. An irregularity morphology model is developed using the simplest possible source function, classical diffusion, and a simple two-celled magnetospheric convection model. While the qualitative results of this model are encouraging, emphasis is placed on its limitations and how it can be improved in the future. The motivation for this study is two-fold; first, it is important ot predict the severity of propagation disturbances in the nuclear disturbed environment. In the absence of actual nuclear data, naturally occurring auroral disturbances provide a test bed for assessing the accuracy of predictive codes. Second, naturally occurring plasma density irregularities hinder DoD communications and surveillance systems. Therefore, understanding the processes that control the evolution and ultimate morphology of naturally structured plasma can help to predict system performance and perhaps develop mitigants.

**3500 (AD-A—130953/3) Polar cap electron DEnsities from de-1 plasma wave observations. Progress report.** Persoon, A.M.; Gurnett, D.A.; Shawhan, S.D. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). 11 Jun 1983. 62p. NTIS, PC A04/MF A01.

Electric field spectrum measurements from the Plasma Wave Instrument on the Dynamics Explorer-1 spacecraft are used to study the local electron density at high altitudes in the northern polar cap region. The electron density is determined from the upper cutoff of whistler mode radiation at the electron plasma frequency. This technique typically gives the electron density with; an accuracy better than 12%.

3501 **(AD-A—131274/3) Nuclear-induced lightning aurora experiment. Technical report.** Erler, J.W.; Passenheim, B.C.; Vulliet, W.G.; van Lint, V.A.J. (Mission Research Corp., San Diego, CA (USA)). 11 Aug 1982. 68p. (MRC/SD-R—103). NTIS, PC A04/MF A01.

Nuclear lightning has been experimentally produced at AURORA. The propagation velocity, the current carried by the streamer and other parameters were measured. The results are compared with existing models.

3502 **(AD-A—131431/9) High-latitude and equatorial research support for predicting high-altitude nuclear effects. Technical report.** Rino, C.L.; Vickrey, J.F.; Livingston, R.C.; Tsunoda, R.T. (SRI International, Menlo Park, CA (USA)). 1 Aug 1982. 54p. NTIS, PC A04/MF A01.

This report summarizes the high-latitude and the equatorial natural ionospheric research support that has been conducted to improve and extend high-altitude nuclear predictive capability. This work marks the formal completion of the equatorial research effort. That effort has been very successful and the results are summarized in detail. The primary future effort will be directed toward auroral phenomena. The preliminary work in this area is described in the report.

3503 **(AD-A—131448/3) Geomagnetic pulsations-production/interpretation. Final scientific report 1 Sep 78-30 Sep 81.** Maple, E. (Emmanuel Coll., Boston, MA (USA)). Sep 1982. 58p. NTIS, PC A04/MF A01.

Work has been devoted to experimental studies of middle-latitude geomagnetic pulsations in the period range 0.2 to 50 minutes. The principal effort has been on the resonant periods of the pulsations which arise from hydromagnetic resonances in the magnetosphere. The resonant periods appear as peaks in the period distributions and frequency spectra of the pulsations. The present work utilizes polarization traces which provide continuous displays of the polarization of the pulsations in selected period bands. This analysis technique was conceived some time ago. The early studies established that hydromagnetic (HM) waves were frequently observed throughout the 0.2 to 50 minute period range and that waves of several different periods were often observed simultaneously during both magnetically quiet and disturbed intervals. That effort was terminated before the potentialities of the technique had been exploited, and the early results were not widely disseminated. Some of the original data have been resurrected for the initial work under this grant, and the analysis technique has been extended.

3504 **(LA-UR—83-2997) Microinstabilities in the high latitude F region: a brief review.** Gary, S.P. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 32p. (CONF-8310204—1). NTIS, PC A03/MF A01. Order Number DE84001709.

From DNA hilat/late time meeting; Palo Alto, CA, USA (5 Oct 1983).

This is a review of the theory of plasma microinstabilities that may arise in the high latitude F region ionosphere below 1000 km. Three free energy sources are considered: a density gradient perpendicular to the ambient magnetic field B, a current parallel to B and a steady electric field perpendicular to B. The BGK model for charged-neutral collisions is used, and the short wavelength properties of the universal density drift, current convective and E x B gradient drift instabilities are compared. At sufficiently high altitudes and sufficiently steep gradients, the universal instability is the short wavelength mode most likely to grow and, through wave-particle diffusion, to cause relatively steep wavenumber dependences in power spectra.

3505 **Development of substorm activity in multiple-onset substorms at synchronous orbit.** Nagai, T.; Baker, D.N.; Higbie, P.R. (Space Science Laboratory, NASA Marshall Space Flight Center, Kakioka Magnetic Observatory, Japan Meteorological Agency). *Journal of Geophysical Research;* **88**: No. A9, 6994-7004(1 Sep 1983).

The development of substorm activity at synchronous orbit (6.6 R/sub E/) for multiple-onset substorms was studied by using the energetic particle and magnetic field data in three local time groups (the afternoon region, the premidnight region, and the postmidnight region). The geostationary spacecraft 1976—059 and 1977—007 provided the measurements of 30- to 2000-keV electrons and 145- to 560-keV protons, GMS the measurements of >2000 keV electrons, and GOES 1 and GOES 2 the measurements of the magnetic field. The ground magnetic variations in a wide area were examined to determine the general characteristics of substorm activity and the timing of various phenomena. The substorm evolutions showed a variety of forms at synchronous orbit, but they can be characterized by the following view: Substorm activity initially starts in a longitudinally limited sector that is situated in the premidnight region, and the effect of this activity is not seen in other regions. The activity then expands westward and eastward during a period of successive onsets. There is an indication that the westward propagation is faster than the eastward propagation.

3506 **Plasma regimes in the deep geomagnetic tail: ISEE 3.** Bame, S.J.; Anderson, R.C.; Asbridge, J.R.; Baker, D.N.; Feldman, W.C.; Gosling, J.T.; Hones, E.W. Jr.; McComas, D.J.; Zwickl, R.D. (University of California, Los Alamos National Laboratory, Los Alamos, NM 87545). *Geophysical Research Letters;* **10**: No. 9, 912-915(Sep 1983).

Using a lunar gravitation-assisted orbit, the ISEE-3 spacecraft remained close to and within a previously unexplored part of the distant (60—220 R/sub E/) geomagnetic tail nearly continuously from 1 January to 30 March 1983. An initial analysis of data obtained with the Los Alamos plasma electron analyzer onboard ISEE-3 reveals that all of the plasma regimes identified previously with near-earth measurements (i.e., plasma sheet, low-latitude boundary layer, plasma mantle, lobe, and magnetosheath) remain recognizable entities in the distant tail as well. However, these regimes apper to be intermingled in a more chaotic fashion than near the earth. Typical flow velocities within the plasma sheet at ~200 R/sub E/ in this preliminary analysis are ~500 km $s^{-1}$ tailward, considerably higher than is characteristic of the near-earth plasma sheet. Earthward flow within the plasma sheet has been observed occasionally, suggesting the temporary presence of a neutral line beyond 220 R/sub E/. Strong bi-directional electron anisotropies are found throughout much of the distant plasma sheet, boundary layer, and magnetosheath.

3507 **Evolution of ion distributions across the nearly perpendicular bow shock: specularly and non-specularly reflected-gyrating ions.** Sckopke, N.; Paschmann, G.; Bame, S.J.; Gosling, J.T.; Russell, C.T. (Max-Planck-Institut fuer Physik und Astrophysik, Institut fuer Extraterrestriche Physik, 8046 Garching, Federal Republic of Germany). *Journal of Geophysical Research;* **88**: No. A8, 6121-6136(1 Aug 1983).

Ion velocity space distributions measured with Los Alamos/Garching instruments on ISEE 1 and 2 across the earth's bow shock have revealed that the nearly perpendicular shock reflects some fraction of the incident solar wind ions over a wide range of Mach numbers (M/sub A/≅2.0-12.4). The relative density of the reflected ions varies from 1-3% of the solar wind density at M/sub A/roughly-equal2 to 15-25% at M/sub A/ = 8-12, in qualitative agreement with computer simulations and with predictions that indicate that such ions are needed to provide essential dissipation at the shock. These ions gyrate about B in the plasma rest frame with a speed of ~2 v/sub i/n, where r/sub i/n is the normal component of the solar wind flow, and their density increases by ~2 orders of magnitude at the foward end of the "foot" of the shock profile ~0.7 ion gyroradii upstream from the shock ramp. This is substantial evidence that the bulk of these ions have been reflected at the shock in a nearly specular fashion. Depending on the shock geometry, some low numbers of reflected-gyrating ions are sometimes observed a few gyroradii ahead of the outer edge of the foot. Model calculations suggest that these additional ions are produced by nonspecular reflection of a much smaller fraction of the incident solar wind. Downstream of the shock ramp, the secondary ions gyrate with a slightly higher speed, v/sub g/roughly-equal2.15 v/sub i/n, in the downstream rest frame. Individual groups of gyrating ions rapidly disperse in velocity space to form a high-energy torus centered at the bulk velocity of the distributions.

**3508 ISEE 3 high time resolution study of interplanetary parameter correlations with magnetospheric activity.** Baker, D.N.; Zwickl, R.D.; Bame, S.J.; Hones, E.W. Jr.; Tsurutani, B.T.; Smith, E.J.; Akasofu, S. (Los Alamos National Laboratory). *Journal of Geophysical Research;* **88**: No. A8, 6230-6242(1 Aug 1983).

From 1978 to 1982 the ISEE 3 spacecraft was in a "halo" orbit around the sun-earth Lagrangian point $L_1$ approximately 240 R/sub E/ upstream of the earth and was continuously in the upstream solar wind. In order to evaluate the efficacy of such a spacecraft as a real time interplanetary monitor to predict substorm activity and to measure solar wind energy input into the terrestrial magnetosphere, three periods in 1978 were selected in which to perform detailed correlation analyses between solar wind and interplanetary magnetic field (IMF) parameters and magnetospheric activity indices such as AE and Dst. High time resolution (1 min) averages of combined solar wind parameters and IMF parameters were used to perform linear cross-correlation analyses with the similarly averaged magnetospheric activity indices. A significant dependence of these results on levels of activity is found. During relatively quiet conditions, all tested parameters ($\epsilon$, VB/sub S/, $V^2B$/sub x/) produce high (0.7—0.8), nearly identical linear correlation coefficients with AE. During disturbed times, substantially lower correlations between all parameters and AE are found ($r<$ or $\simeq 0.6$ for VB; $r<$ or $\simeq 0.4$ for $\epsilon$). A measure of total magnetospheric energy dissipation (U/sub T/) involving both auroral and ring current terms is useful and can be meaningfully calculated during disturbed periods of geomagnetic storm (or stormlike) activity. U/sub T/ is rather highly correlated ($r>0.6$) with all tested parameters during disturbed times. The parameter $\epsilon$ is often superior to the B/sub x/ parameters in prediction of U/sub T/.

**3509 New observations of plasma vortices and insights into their interpretation.** Hones, E.W. Jr.; Birn, J.; Bame, S.J.; Russell, C.T. (University of California, Los Alamos National Laboratory, Los Alamos, NM 87545). *Geophysical Research Letters;* **10**: No. 8, 674-677(Aug 1983).

Two- and three-dimensional plasma measurements made with the ISEE 1 and 2 satellites during sixteen plasma vortes occurrences in the magnetotail plasma sheet are used to develop a fuller description of the vortes phenomenon than has existed heretofore. We studied in particular the phase and energy propagation properties of the vortex waves. The rotation period of the vortices (Troughly-equal 10 +- 5 minutes) is apparently independent of location, while the wavelength ($\lambda>$ or $\simeq$ several Re) increases with increasing distance down the tail, pointing to a global mode of propagation in which effects of inhomogeneous equilibrium are important. The flow rotation can be explained by propagation of surface waves or resonant waves in a uniform medium. Other observed features, however, require a nonuniform model: Nonuniform propagation properties and differences of the phase propagation speed calculated from different components of velocity or magnetic field.

**3510 Comparison of spherical double probe electric field measurements with plasma bulk flows in plasmas having densities less than 1 $cm^{-3}$.** Mozer, F.S.; Hones, E.W. Jr.; Birn, J. (Physics Department and Space Sciences Laboratory, University of California, Berkeley, CA 94720). *Geophysical Research Letters;* **10**: No. 8, 737-740(Aug 1983).

Point-by point comparisons of ISEE-1 spherical double probe dawn-to-dusk electric field measurements and ISEE-2 plasma flows, converted to electric fields, are presented during a three hour time interval in the magnetotail when the plasma density varied from less than 0.1 to about 1 $cm^{-3}$. The zero lag cross-correlation coefficient between 768 second averages of the two data sets was 0.93. The cross-correlation coefficient decreased with shorter averaging intervals due to the increasing magnitude of statistical uncertainties, becoming 0.49 for 9 second averages. A statistical relative uncertainty between pairs of points in the two data sets, estimated by inclusion only of counting statistics in the plasma measurement and time variations of the observed electric field during the measurement interval, is able to account for at least 75% of the deviations between the two data sets. During this three hour interval, the spacecraft potential (measured by the double probe instrument) varied as the logarithm of the product of the plasma density and square root of electron temperature (measured by the fast plasma analyzer), in agreement with expectations from simple Langmuir probe theory.

## 6403 Atomic, Molecular, And Chemical Physics

*REFER ALSO TO CITATION(S) 2816, 2890, 2967, 3006, 3023, 3705, 3865, 3866, 3932, 3978, 4027, 4167, 4168, 4169, 4170, 4225*

**3511 (AD-A—130277/7) Resonance fluorescence of a two-level atom near a metal surface. Technical report.** Huang, X.; Lin, J.; George, T.F. (Rochester Univ., NY (USA). Dept. of Chemistry). Jun 1983. 30p. NTIS, PC A03/MF A01.

A derivation of surface-dressed optical Bloch equations, involving a treatment of surface-reflected photons and a surface plasmon resonance, is presented for a collision-damped two-level atom near or adsorbed on a metal surface. Effects of the laser bandwidth are included by means of a phase-diffusion model for the driving field. In the weak-field or large detuning limit, the population inversion and resonance fluorescence spectrum are obtained analytically. These quantities along with the surface-induced phase-decay constant of the adatom show strong oscillatory behavior as a function of the adatom-surface distance.

**3512 (AD-A—131777/5) Study of excited state energy transfer processes. Final report 1 Jan 81-31 Dec 82.** Barthel, J.R.; Duff, R.E.; Proffer, W.J. (Massachusetts Inst. of Tech., Cambridge (USA). Research Lab. of Electronics). 11 May 1983. 3p. NTIS, PC A02/MF A01.

Several scaling and fitting laws for rotationally inelastic (RI) collisions have been developed and applied. These laws will provide a compact description of collisional processes for use in technological applications.

**3513 (ANU-P—808) Quantum calculation of heavy-particle backscattering by thin single crystals.** Treacy, P.B. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Oct 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703983.

This article reviews the problem of whether it is necessary to compute backscattering of MeV ions using quantum mechanics. Arguments are given that support the need to include quantum Fresnel diffraction in backscattering by adequately thin single crystals. The particle-scattering problem is investigated using a many-body approximate wave function, defined by a generalised product of two-body scattering wave function. To apply such a wave function to realistic systems, the inclusion of screened Coulomb wave functions and of lattice correlations is proposed and discussed. Examples of computed axial backscattered angular scans are given for 2 MeV proton scattering by strings of 50-atom-layer Cu and Au, and some unexpected interference effects found.

**3514 (BNL—33685) Differences between positrons and electrons in elastic and inelastic processes at surfaces.** Canter, K.F.; Lynn, K.G. (Brandeis Univ., Waltham, MA (USA). Dept. of Physics; Brookhaven National Lab., Upton, NY (USA)). Sep 1983. Contract AC02-76CH00016. 23p. (CONF-831171—13). NTIS, PC A02/MF A01. Order Number DE84001208.

From American Vacuum Society meeting; Boston, MA, USA (1 Nov 1983).

The elastic scattering of positrons of 30 to 300 eV differs significantly from electrons, i.e., a lack of an exchange interaction and ion core repulsion, instead of attraction. Inelastic scattering also differs because there are no final scattering states for the positron which are excluded by the Pauli principle, thus resulting in a shorter positron elastic mean free path. The resulting advantages of LEPD over LEED will be discussed. When a positron is implanted and thermalizes in a solid, many possible fates occur which differs from electrons. The dominant processes for positrons occurring at a metallic surface are (i) localization in a surface state, and (ii) direct reemission from the metal into the vacuum in those systems which exhibit a negative positron work function; during this reemission process the positrons can loose energy by exciting molecular vibra-

tions, (iii) reemission into the vacuum with an electron, thus forming positronium. 47 references.

3515 **(DOE/ER/02887—T1) Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984.** Dalgarno, A. (Harvard Coll. Observatory, Cambridge, MA (USA)). Nov 1983. Contract AC02-76ER02887. 9p. NTIS, PC A02/MF A01. Order Number DE84002279.

A lengthy paper has been published (Heil, Butler and Dalgarno 1983) which describes the charge transfer of doubly and trebly-charged ions of carbon, nitrogen, oxygen and neon ions with atomic hydrogen at thermal energies. Adiabatic potential energy curves and radial coupling matrix elements are presented. The collision cross sections are calculated in a diabatic formulation. For the trebly-charged ions there is at least one exit channel into which charge transfer is highly probable. Cross sections for doubly-charged ions are sensitive to the energy level structure of the ionic species. Experimental data are available at an energy of leV for $O^{2+}$ and $O^{3+}$ ion in atomic hydrogen (Church and Holzscheiter 1982) which are in harmony with the theoretical predictions. We have extended the calculations to higher energies by introducing a procedure in which close-coupling solutions are used for low angular momenta, a unitarized second-order distorted wave approximation for intermediate angular momenta and a first-order distorted wave approximation for high angular momenta, each method giving way to the simpler one as the simpler method becomes sufficiently accurate. A paper describing the procedures is in press (Bienstock, Heil and Dalgarno 1984a).

3516 **(DOE/ER/10371—5) Negative-ion detachment cross sections. Progress report, March 1, 1983-February 28, 1984.** Champion, R.L.; Doverspike, L.D. (College of William and Mary, Williamsburg, VA (USA). Dept. of Physics). 1 Nov 1983. Contract AS05-79ER10371. 9p. NTIS, PC A02/MF A01. Order Number DE84002653.

During the past year a variety of studies involving collisions of negative ions with selected molecular targets have been completed. Absolute cross sections for electron detachment and for charge transfer and dissociative charge transfer have been measured for collision energies ranging from below threshold for electron detachment up to several hundred eV. In addition, doubly-differential experiments have also been performed for some of the same systems. In what follows, brief summaries of the results obtained thus far are given. Reprints and completed manuscripts related to the work are appended to this progress report.

3517 **(DOE/ER/10618—10) Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984.** Fischer, C.F. (Vanderbilt Univ., Nashville, TN (USA). Dept. of Computer Science). 1984. Contract AS05-80ER10618. 11p. NTIS, PC A02/MF A01. Order Number DE84002628.

The Multiconfiguration Hartree-Fock (MCHF) method with the Breit-Pauli correction for relativistic effects has been applied to a number of sytems. The fine-structure splitting of the $2p^3$ levels of nitrogen was investigated as well as the forbidden (E2 and M1) transitions between these levels. Also of particular interest was the term separation and fine-structure splitting for both the $2s^22p^4$ and $2s2p^5$ configurations of oxygen. Transition probabilities for the forbidden transitions between the levels of $2s^22p^4$ have been predicted as well as those for allowed $2s^22p^4$ to $2s2p^5$ transitions. The fine-structure splitting of the $3p^3$ levels of phosphorus was studied and transition probabilities predicted for forbidden transitions between these levels. Both the $2p^3$ and the $3p^3$ sequences are of astrophysical interest where for light atoms the ratio of intensities of lines is an indicator of the electron density. For the more highly ionized species of these sequences, the forbidden transitions have been observed in the tokamak plasmas. In the $3p^3$ sequence, tentative assignments have been made to the observed lines, assignments to be verified by these calculations.

3518 (INIS-BR—79, pp 45) **Characterization of the substrate surface, nucleation and initial growth in the thin film formation.** Dhere, N.G. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil). Secao de Ciencias dos Materiais). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3519 (INIS-BR—79, pp 51-55) **Surface effect theory in binary alloys: surfaces with cut-off.** Kumar, V. (Freie Univ. Berlin (Germany, F.R.). Inst. fuer Theoretical Physics); Silva, C.E.T.G. da (Universidade Estadual de Campinas (Brazil). Inst. de Fisica); Moran-Lopez, J.L. (Instituto Politecnico Nacional, Mexico City. Centro de Investigacion y de Estudios Avanzados). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A surface effect theory in binary alloys which are ordered with surfaces with cut-off is presented. This theory is based in a model of pair interaction between first neighbours and includes long and short range effects. The (120) surface with sup(-) (110) monoatomic cut-off and terrace in the (110) planes of an alloy with body centered cubic structure is presented as example. Results for the concentrations in all the different surface sites are given.

3520 (INIS-BR—79, pp 61-66) **Electron density in reasonably real metallic surfaces, including interchange and correlation effects.** Moraga, L.A. (Chile Univ., Santiago. Facultad de Ciencias); Martinez, G. (Chile Univ., Santiago. Dept. de Fisica). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

By means of a new method, the electron density in a jellium surface is calculated taking into account interchange and correlation effects; reproducing, in this way, the Lang and Kohn results. The new method is self-consistent but not iterative and hence is possible extend it to the solution of the same problem in more reasonably real metallic surfaces.

3521 (INIS-BR—79, pp 67-69) **Polarizability of a metallic surface.** Moraga, L.A.; Esparza, C. (Chile Univ., Santiago. Facultad de Ciencias). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The surface dielectric operator for a semi-infinite 'Jellium' in the random phase approximation is calculated in a semi-analytical form, utilizing as zero-order approximation the Green's function for the finite height well potential. From this one, the interaction potential is calculated with different additional approximations.

3522 (INIS-BR—79, pp 75-78) **Correlation functions of electronic and nuclear spins in a Heisenberg antiferromagnet semi-infinite medium.** Sarmento, E.F. (Alagoas Univ., Maceio (Brazil). Dept. de Fisica); Tilley, D.R.; Cottam, M.G. (Essex Univ., Colchester (UK). Dept. of Physics); Ziks, B. (Institut Jozef Stefan, Ljubljana (Yugoslavia)). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Results are found for the dynamical correlation functions (or its corresponding Green's functions) among any combination including operator pairs of electronic and nuclear spins in an antiferromagnet semi-infinite medium, at low temperatures T<<T sub(N). These correlation functions are used to investigate at the same time the wave properties of surface spins in the volume and surface. Dispersion relations of the coupled modes of electronic and nuclear spin waves in the surface are found resolving a linear equation system of spin operators.

3523 (INIS-BR—79, pp 79-82) **Thermodynamical properties of an Ising ferromagnet in a semi-infinite medium.** Sarmento, E.F.; Tahir-Kheli, R.A. (Alagoas Univ., Maceio (Brazil). Dept. de Fisica); Fittipaldi, I.P.; Kaneyoshi, T. (Pernambuco Univ., Recife (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A formalism recently developed by Kaneyoshi and collaborators is applied to investigate the magnetization behavior with the temperature in the different shells of an Ising ferromagnet model with spin 1/2 in a semi-infinite-medium.

3524 (INIS-BR—79, pp 83-85) **Phase transitions in two dimensions.** Henderson, D. (IBM Research Div., San Jose, CA (USA)). Oct 1981. NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Several papers related with melting in two dimensions are reviewed, in particular, those related to the two-dimensional Lennard-Jones system. (L.C.).

3525 (INIS-BR—79, pp 89) **Surface tension calculation of the Ising model in square lattice using the renormalization group.** Curado, E.M.F.; Tsallis, C.; Levy, S.V.F. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro); Oliveira, M.J. de (Sao Paulo Univ. (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3526 (INIS-BR—79, pp 91) **Surface nuclear spin waves in a semi-infinite ferromagnetic insulator.** Sarmento, E.F. (Alagoas Univ., Maceio (Brazil). Dept. de Fisica); Cottam, M.G. (Essex Univ., Colchester (UK). Dept. of Physics). Oct 1981. NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3527 (INIS-BR—79, pp 95-98) **Structure study and the adsorption system mechanism based on 'stratified volume' model.** Tapia H, N.J. (Universidad Nacional Mayor de San Marcos, Lima (Peru)). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A new thermodynamic model for the investigation of the structure and mechanism of the adsorption phenomenon at low temperature is presented.

3528 (INIS-BR—79, pp 125-128) **Research programs in adsorption carried out in the low temperature laboratory of UFRJ (Brazil).** Rapp, R.E. (Rio de Janeiro Univ. (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Research programs of gas adsorption in thin films carried out by the low temperature laboratory of UFRJ (Brazil) are reported. These programs were divided in two parts: 1) experiments of adsorption isotherm measurements by the volumetric method and 2) specific heat measurements of adsorbed gases.

3529 (INIS-BR—79, pp 129-134) **Thermodynamic analysis of the adosrbed Ne in exfoliated graphite.** Souza, J.L.D. de; Rapp, R.E.; Souza, E.P. de; Lerner, E. Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Experimental data of specific heat of adsorbed Ne in exfoliated graphite are obtained. Such results show the existence of two anomalies in the specific heat vs temperature graph in the investigated region. Isotherms for these proçesses are also obtained.

3530 (INIS-BR—79, pp 187-190) **Momentum transfer in a Brillouin surface scattering.** Khater, A.F. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The transfer momentum in a Brillouin surface scattering for opaque materials is discussed. The total cross section for this scattering is obtained.

3531 (INIS-BR—79, pp 215) **Mathematical adjusts to ESCA spectra.** Tejeda, J. (Instituto Mexicano del Petroleo, Mexico City). Oct 1981. (In Spanish). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3532 (INIS-BR—79, pp 221) **Kapitza resistance theory.** Khater, A.F. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3533 (INIS-BR—79, pp 227) **Charged particle interaction with the oscillation modes of a surface.** Bodas, E.L. de; Hipolito, O. (Sao Carlos Univ. (Brazil). Dept. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Published in summary form only.

3534 (INIS-mf—8271) **Raman and infrared spectroscopic studies of the structure of water ($H_2O$, HOD, $D_2O$) in stoichiometric crystalline hydrates and in electrolyte solutions.** Buanam-Om, C. (Marburg Univ. (Germany, F.R.). Fachbereich Physikalische Chemie). 22 May 1981. 303p. NTIS (US Sales Only), PC A14/MF A01. Order Number DE83704385.

The chapter of reviews presents in particular the Badger-Bauer-rule, distance and angle dependence of O-H...Y hydrogen bond and the structure of aqueous electrolyte solutions. A chapter of vibrational spectroscopic investigations of crystalline hydrates - metal perchlorate hydrates follows. Two further chapters just so investigate metal halide hydrates and some sulfate hydrates and related systems. The following chapter describes near infrared spectroscopic investigations of HOD($D_2O$) and its electrolyte solutions. The concluding chapter contains thermodynamic consequences and some properties of electrolyte solutions from vibrational spectroscopic investigations.

3535 (INIS-mf—8565) **Progress report 1982 of the Institute of Experimental Physics of the Leopold Franzens University Innsbruck.** Howorka, F.; Maerk, T.; Lindinger, W. (eds.). (Innsbruck Univ. (Austria)). 1983. 31p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703831.

This progress report describes the scientific work and research results of the Department of Atomic Physics in the Institute of Experimental Physics of the University of Innsbruck for the period of 1982. A comprehensive list of publications of this department is given.

3536 **(JINR—11-82-739) Computer code realization for a mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber.** Semerdzhiev, Kh. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703824.

A mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber is realized as a FORTRAN-code. The essential parameters of the code are described, and the full text of the program is presented.

3537 **(JINR—R-14-82-212) Analysis of experimental data on mesic X-ray spectra of metals and their oxides.** Pokrovskij, V.N.; Yutlandov, I.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704300.

The experimental data on mesic X-ray spectra of metals and their oxides are examined. The Z-dependence of the Ksub($\beta$)/Ksub($\alpha$) ratio for metals of the first transition period is very similar to that of metallic valency of these elements. On account of this analogy the Ksub($\beta$)/Ksub($\alpha$) is presumed to be proportional to the number of bonding electrons and their degree of delocalization. On this assumption the Z-dependence of the value (Ksub($\beta$)/Ksub($\alpha$))ox./(Ksub($\beta$)/Ksub($\alpha$))met. is readily understood. The underlying reason for this behaviour of transition metals seems to be related with mixing to 3d and 3p (Z=21-30) or 4d and 4p (Z=39-48) levels favouring p-subshell. The mixing should result in relative increase of Ksub($\beta$)- and decrease of Ksub($\alpha$)-, Lsub($\alpha$)- or increase of Ksub($\gamma$)-intensity, respectively. All this permits to suggest that properties of low-lying mesic levels in mesic atoms are recurrent with basic features of corresponding electron levels. As a consequence, the certain analogy between X- and $\mu$X-rays should exist and it is indeed observed in some cases, e.g. for dependence of Ksub($\beta$)/Ksub($\alpha$) on valence state. The problem of zero-valence reference point for mesic chemistry work is also discussed.

3538 **(JINR—R-14-82-605) Study on muon depolarization at magnetic phase transition in $V_2O_3$.** Balandin, M.P.; Evseev, V.S.; Mamedov, T.N.; Roganov, V.S.; Frontas'eva, M.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703988.

By spin precession method in a magnetic field, the temperature dependence of residual polarization of $\mu^-$-mesons in oxygen mesic atom produced in $V_2O_3$ is investigated. Its jump at Neel's temperature is discovered. The $\mu^{+-}$-meson spin relaxation in $V_2O_3$ is also found.

3539 (LA—9798-P, pp 383-390) **Muonium.** Egan, P.O. (Yale Univ., New Haven, CT). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Two experiments, the measurement of the muonium hyperfine interval and the production of muonium in vacuum, are reviewed. The prospects for significant improvements in these and related experiments using pulsed, stopping muon beams from LAMPF II are evaluated and found to be excellent. 20 references.

3540 (LA—9798-P, pp 395-398) **Solid-state physics and chemistry.** Heffner, R.H. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The applications of the muon spin rotation ($\mu$SR) technique to problems in materials science and muon chemistry studies including muonium reactions and muonic radicals are discussed. Experimental possibilities at LAMPF II are discussed. (WHK)

3541 **(LA-UR—83-3014) Electron-electron interactions and broken symmetry in one dimension.** Mazumdar, S.; Dixit, S.N. (Los Alamos National Lab., NM (USA); Exxon Research and Engineering Co., Linden, NJ (USA). Corporate Research Science Lab.). 1983. Contract W-7405-ENG-36. 16p. (CONF-8308133—1). NTIS, PC A02/MF A01. Order Number DE84001704.

From Workshop on synthetic metals; Los Alamos, NM, USA (20 Aug 1983).

A novel real space approach to dimerization in a half-filled band is developed to investigate effects of electron-electron interactions of the Peierls instability. Dimerization is shown to be a result of imperfect resonance between pairs of electron configurations related to each other by a mirror plane symmetry passing through the longest diagonal of the infinite polygon. Coulomb interactions enhance the barrier to perfect resonance, so that dimerization itself is enhanced for moderate values of the correlation parameter. Recent experimental findings and the present theoretical work then suggest that explicit inclusion of Coulomb interactions between electrons may be necessary for an accurate description of ground and excited states in polyacetylene.

3542 **(LA-UR—83-3095) Angle-averaged Compton cross sections.** Nickel, G.H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 12p. (CONF-8310178—1). NTIS, PC A02/MF A01. Order Number DE84001721.

From 2. international conference and workshop on radiative properties of hot dense matter; Sarasota, FL, USA (31 Oct 1983).

Portions are illegible in microfiche products.

The scattering of a photon by an individual free electron is characterized by six quantities: $\alpha$ = initial photon energy in units of $m_0c^2$; $\alpha$/sub s/ = scattered photon energy in units of $m_0c^2$; $\beta$ = initial electron velocity in units of c; phi = angle between photon direction and electron direction in the laboratory frame (LF); theta = polar angle change due to Compton scattering, measured in the electron rest frame (ERF); and tau = azimuthal angle change in the ERF. We present an analytic expression for the average of the Compton cross section over phi, theta, and tau. The lowest order approximation to this equation is reasonably accurate for photons and electrons with energies of many keV.

3543 **(PB—83-242388) Atomic structure Hartree-Fock-relativistic and Hartree-XR program-package translated for IBM from the Cowan-CDC version, plus the Zeeman parameter optimisation routines.** Fawcett, B.C. (Rutherford Appleton Lab., Chilton (UK)). [nd]. 47p. (RL—83-030). NTIS, PC E04/MF E04.

A description for the program-user is provided to enable the execution of a suite of atomic-structure programs translated from the Cowan-CDC-Los Alamos version and now operational under CMS on the Rutherford and Appleton Laboratory central mainframe computer. Wavelengths, atomic energy levels and oscillator strengths are computed 'ab initio' with this suite. In addition, autoionization transition probabilities, photoionization cross-sections and plane-wave-Born collision strengths can be computed.

3544 **(UCRL—15564) Time-dependent study of radiation trapping by time-delayed two-photon absorption.** Molander, W.; Belsley, M.; Streater, A.; Burnett, K. (Colorado Univ., Boulder (USA); National Bureau of Standards, Boulder, CO (USA)). Oct 1983. Contract W-7405-ENG-48. 19p. NTIS, PC A02/MF A01. Order Number DE84002786.

The transport of resonance radiation through an optically thick vapor of Sr atoms is studied. A pulsed dye laser tuned to the 461 nm resonance line excites a narrow ($\sim$ 60 $\mu$m diam) column of Sr atoms along the axis of a cylindrical oven containing Sr vapor and Ar buffer gas. After a delay of $\leqq$ 80 ns, a second dye laser excites the atom from the first excited state (5s5p) to a higher excited state (5s7s). The fluorescence from this latter transition is monitored as the second laser is translated parallel to the first. Since the excited state-excited state fluorescence is not trapped the result is a plot of density of atoms in the 5s5p state as a function of position from the originally excited volume. The results are discussed qualitatively.

**3545 (UCRL—89753) Raman spectroscopy of shocked water.** Holmes, N.C.; Mitchell, A.C.; Nellis, W.J.; Graham, W.B.; Walrafen, G.E. (Lawrence Livermore National Lab., CA (USA); Howard Univ., Washington, DC (USA)). Jul 1983. Contract W-7405-ENG-48. 5p. (CONF-830719—56). NTIS, PC A02/MF A01. Order Number DE84002468.

From American Physical Society meeting on shock waves in condensed media; Santa Fe, NM, USA (18 Jul 1983).

Raman scattering has been used extensively to study the vibrational and rotational properties of molecules under a variety of conditions. Here, interest is in the behavior of water molecules shocked to high pressures and temperatures. Behind the shock front the water molecules undergo changes in bonding and the molecules may become ionized. Raman spectroscopy can be used to determine the molecular species behind the shock front. In addition, changes in Raman spectra can yield information regarding inter- and intramolecular potentials and the temperature behind the shock front.

**3546 (UCRL—89993) Generation of vibrationally excited $H_2$ molecules by $H_3^+$ wall collisions.** Hiskes, J.R.; Karo, A.M. (Lawrence Livermore National Lab., CA (USA)). 11 Nov 1983. Contract W-7405-ENG-48. 9p. (CONF-831180—3). NTIS, PC A02/MF A01. Order Number DE84003021.

From 3. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (14 Nov 1983).

The $H_3^+$ ions from the volume of a hydrogen discharge will strike the discharge chamber walls with a kinetic energy equivalent to the plasma potential. A three-step process is described in which the $H_3^+$ ions are neutralized in a two-stage Auger process followed by a third stage wall relaxation collision, with the net result that the incident ions are converted to ground state molecules having a broad vibrational excitation spectrum. For kinetic energies ranging from a few electron volts up to twenty electron volts a substantial fraction, $\simeq 2/3$, of these ions will reflect as molecules, and of this population a fraction as large as twenty percent will have vibrational excitation of $v'' \geqq 6$. This large vibrational population will provide a contribution to the total excited level distribution that is comparable to the E-V process. Implications for negative ion generation in an optimized tandem configuration are discussed.

**3547 Spectroscopic studies of the jet-cooled copper trimer.** Morse, M.D.; Hopkins, J.B.; Langridge-Smith, P.R.R.; Smalley, R.E. (Rice Quantum Institute and Department of Chemistry, Rice University, Houston, Texas 77251). *Journal of Chemical Physics;* **79**: No. 11, 5316-5328(1 Dec 1983).

Gas phase spectroscopic studies of copper trimer are reported. A band system in the 5430—5225 A region has been assigned to $Cu_3$ and has been studied by resonant two-photon ionization spectroscopy, spectroscopy by depletion through predissociation, and by radiation repopulation of excited vibrational states in a cold supersonic molecular beam. The spectrum fits well to a $^2E'' \leftarrow ^2E'$ transition of a D/sub 3h/ molecule with both states undergoing Jahn—Teller distortions. In this interpretation, the excited state is well described by a weak Jahn—Teller effect, stabilizing the molecule at a configuration in which one Cu—Cu bond length differs from the others by 0.03 A, with a Jahn—Teller stabilization energy of 9 $cm^{-1}$. The ground electronic state corresponds to a deep Jahn—Teller situation with the lowest vibronic levels trapped in the distorted configuration. The spectra indicate the tunneling splitting of the lowest vibrational levels in the ground state is 12 +- 7 $cm^{-1}$. These assignments are based on measured vibrational band positions and may not be unique. Definitive determination of the copper trimer structure will require analysis of rotational fine structure which was unresolved with the laser sources available in this study.

**3548 Ab initio studies of excited states of polyatomic molecules including spin-orbit and multiplet effects: The electronic states of $UF_6$.** Hay, P.J. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **79**: No. 11, 5469-5482(1 Dec 1983).

The excited electronic states of $UF_6$ between 3—10 eV are investigated by ab initio configuration interaction (CI) calculations using a relativistic effective core potential (RECP) on the uranium and nonrelativistic ECP's on the fluorines. Spin-orbit coupling effects are incorporated by diagonalizing an effective one-electron operator over the CI wave functions. This represents one of the first studies of polyatomic molecules to treat both spin-orbit effects and multiplet effects arising from electron—electron interactions. A detailed analysis of the electronic states of $UF_6$ is given both with and without spin-orbit coupling effects. Assignments for the major peaks in the 3—10 eV energy range are given, as aided by recent electron impact studies. Comparisons are made between the present many-electron states and previous one-electron theoretical treatments.

**3549 Cross sections for electron impact excitation of electronic states in $UF_6$ at incident electron energies of 10, 20, and 40 eV.** Cartwright, D.C.; Trajmar, S.; Chutjian, A.; Srivastava, S. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **79**: No. 11, 5483-5493(1 Dec 1983).

The inelastic scattering of electrons by $UF_6$ has been studied at incident electron energies of 10, 20, and 40 eV, and for scattering angles of 20, 60, 90, and 135 deg. Using the structure of the energy-loss spectra, and recent theoretical work as a guide, the numerous electronic states between 3.3 and 10.0 eV were combined into nine inelastic features. These nine features were then examined in the electron energy-loss spectra by using a simple model to fit all the spectra in a least-squares sense and extract absolute differential cross sections for excitation of these composite features. Absolute integral cross sections were also obtained at these three incident electron energies. Absolute cross sections for elastic scattering of electrons by the $UF_6$ molecule are also reported at impact energies ranging from 5 to 100 eV.

**3550 Chaos in the multiple photon excitation of molecules due to vibration-rotation coupling at lowest order.** Galbraith, H.W.; Ackerhalt, J.R.; Milonni, P.W. (Theoretical Division, MS J569, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **79**: No. 11, 5345-5350(1 Dec 1983).

We study the multiple photon excitation of a molecule with a triply degenerate near-resonant IR-active mode. The molecule is described by its zeroth-order Hamiltonian as an uncoupled harmonic oscillator-rigid rotor. The molecule-field interaction is dipolar with the field treated semiclassically. The Hiesenberg equations of motion are solved in the classical approximation and chaos is found when the photon absorption exceeds the $t = 0$ angular momentum. The origin of the chaos is due to the nonconservation of the molecule angular momentum.

**3551 Nonadiabatic approach for resonant molecular multiphoton absorption processes in intense infrared laser fields.** Ho, T.; Chu, S. (Department of Chemistry, University of Kansas, Lawrence, Kansas 66045). *Journal of Chemical Physics;* **79**: No. 10, 4708-4718(15 Nov 1983).

A nonperturbative approach for efficient and accurate treatment of the molecular multiphoton absorption (MPA) quantum dynamics in intense infrared (IR) laser fields is presented. The approach is based on the adiabatic separation of the fast vibrational motion from the slow rotational motion, incorporating the fact that the IR laser frequency is close to the frequencies of adjacent vibrational transitions. One thus first solves the quasivibrational energy (QVE) states (or, equivalently, the dressed vibrational states) with molecular orientation fixed. This reduces the computationally often formidable (vibrational-rotational) Floquet matrix analysis to a manageable scale, and, in addition, provides useful physical insights for understanding the nonlinear MPA dynamics. The QVE levels are found to be grouped into distinct energy bands, characterized by the IR frequency, with each band providing an effective potential for molecular rotation. Whereas the interband couplings are totally negligible, the intraband nonadiabatic angular couplings are the main driving mechanisms for inducing resonant vibrational—rotational multiphoton transitions. The utility of the method is illustrated by a detailed study of the sequential MPA spectra for $^{12}C\ ^{16}O$ molecule, including state-to-state multiquantum transitions and transitions from initially thermally distributed states as a whole. Results

are presented for the case of IR laser intensity 50 GW/cm$^2$ and frequencies ranging from 2115 to 2165 cm$^{-1}$. Excellent agreement of the MPA spectra obtained by the nonadiabatic approach and the exact Floquet matrix method was observed in all fine details.

3552 **Spectral studies of cold $UF_6$ solutions.** Maier, W.B. II; Holland, R.F.; Beattie, W.H. (University of California, Los Alamos National Laboratory, Chemistry Division, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **79**: No. 10, 4794-4804(15 Nov 1983).

Absorption spectra of $UF_6$ dissolved in liquid xenon, krypton, nitrous oxide, and methane have been obtained between 300 and 500 nm and between 400 and 4000 cm$^{-1}$. Eighteen infrared bands of $UF_6$ were observed and were moderately (2—9 cm$^{-1}$ FWHM) narrow. The band positions were found to move toward higher wave numbers nu-tilde as the temperature T was increased; dnu-tilde/dT ~0.02 cm$^{-1}$/°C for the bands examined. Some anharmonicity constants were determined and were within experimental error of previous values for $UF_6$ vapor. Integrated absorption cross sections for the $\nu_3$, $\nu_5+\nu_3$, $\nu_2+\nu_3$, and $\nu_1+\nu_3$ bands of $UF_6$ were measured to be roughly-equal1 x 10$^{-16}$, 1.8 x 10$^{-19}$, 5.8 x 10$^{-19}$, and 3.9 x 10$^{-19}$ cm$^2$—cm$^{-1}$, respectively. The solubilities of $UF_6$ in liquid xenon, krypton, and methane have been measured.

3553 **Complex time dependent wave packet technique for thermal equilibrium systems: Electronic spectra.** Reimers, J.R.; Wilson, K.R.; Heller, E.J. (Department of Chemistry, University of California, San Diego, La Jolla, California 92093). *Journal of Chemical Physics;* **79**: No. 10, 4749-4757(15 Nov 1983).

A time dependent wave packet method is presented for the rapid calculation of the properties of systems in thermal equilibrium and is applied, as an illustration, to electronic spectra. The thawed Gaussian approximation to quantum wave packet dynamics combined with evaluation of the density matrix operator by imaginary time propagation is shown to give exact electronic spectra for harmonic potentials and excellent results for both a Morse potential and for the band contours of the three transitions of the visible electronic absorption spectrum of the iodine molecule. The method, in principle, can be extended to many atoms (e.g., condensed phases) and to other properties (e.g., infrared and Raman spectra and thermodynamic variables).

3554 **Inner-valence shell photoionization of $Ar_2$, $Ar_3$, $Kr_2$, and $Kr_3$.** White, M.G.; Grover, J.R. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* **79**: No. 9, 4124-4131(1 Nov 1983).

The inner-valence shell photoionization spectra (420<λ<500 A) of $Ar_2$, $Ar_3$, $Kr_2$, and $Kr_3$ have been obtained with a molecular beam apparatus using synchrotron radiation from the VUV storage ring at the National Synchrotron Light Source. The photoionization spectra exhibit regular series of window resonances which are closely associated with the ms→np Rydberg series in atomic Ar(m = 3) and Kr(m = 4). Vertical ionization potentials of the lowest ionic state in the molecular ms regions were obtained by series extrapolation and these were used to estimate the well depths in the Franck—Condon region and dissociation energies. Assignments of the observed Rydberg transitions were made by analogy with similar excitations in $He_2$ and the group II and II B metal dimers. For $Ar^+_2$ and $Kr^+_2$, the observed structure is tentatively assigned to 1/sub u/ ($^1$Pi/sub u/) and $O^+$/sub u/ ($^1\Sigma$/sub u/ $^+$) states which correlate with the "promoted" nd$\pi$/sub g/ and nd$\sigma$/sub g/ series. Plausible assignments for the trimer spectra are also discussed.

3555 **Electron detachment for $H^-$ ($D^-$) in collisions with Ne.** Wang, T.S.; Delos, J.B. (Department of Physics, College of William and Mary, Williamsburg, Virginia 23185). *Journal of Chemical Physics;* **79**: No. 9, 4306-4309(1 Nov 1983).

Total cross sections for electron detachment in collisions of $H^-$ and $D^-$ with Ne are calculated, using a model based on a first-order solution to close-coupled equations. Quantities needed for the calculation are the energy gap and the coupling between bound and free states. The energy gap is taken from previous calculations and the coupling is assumed to be of exponential form, with parameters adjusted to fit experimental data. Special examination is made of isotope effects in the cross sections.

3556 **van der Waals vibrational modes of the pentacenexR complexes (R = Ne, Ar, Kr).** Leutwyler, S.; Schmelzer, A.; Meyer, R. (Physikalisch-Chemisches Institut der Universitaet Basel, Klingelbergstrasse 80, CH-4056 Basel, Switzerland). *Journal of Chemical Physics;* **79**: No. 9, 4385-4391(1 Nov 1983).

The vibrational van der Waals modes of the pentacenexR van der Waals complexes (R = Ne, Ar, Kr) were theoretically studied. Empirical model calculations according to the method of Ondrechen et al. yielded the pentacenexR potential surfaces. One- and two-dimensional vibrational calculations were performed using two different numerical treatments, yielding the vibrational energies and wave functions of the intermolecular pentacenexR motions, as well as tunnel splittings and tunneling rates. Estimates for the three-dimensional case were derived from the results for one and two dimensions. Anharmonic coupling between the three van der Waals modes are shown to be relatively unimportant. However, partial counterrotation of the whole complex in space, balancing vibrational angular momentum, turned out to have a sizable effect on one of the modes. The calculated results were compared with available experimental data.

3557 **Single-ring magnetic cusp ion source.** Brainard, J.P.; O'Hagan, J.B. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Review of Scientific Instruments;* **54**: No. 11, 1497-1505(Nov 1983).

The single-ring cusp ion source discussed in this paper was developed to provide a dc ion beam in a nonpumped D—T neutron generator. The source operates at 0.25 Pa and produces a uniform-density beam through an aperture of 1.3-cm diameter. At the standard operating voltage of 150 V and arc current of 10 A, the atomic ion content of the 200-mA deuterium ion beam is about 60%, and the ion impurity level is less than 0.5%. The ion output of the source was examined at arc currents of up to 40 A and found to be a linear function; in addition, very high $D^+$ yields were realized. With the aid of a shielded Langmuir probe, we have determined such plasma properties as electron energy, plasma potential, floating potential, and current density throughout the volume of the source. It was observed that the plasma is effectively confined by the magnetic field and there is evidence of an electron energy filtering mechanism similar to that found in multicusp ion sources. Electron energy on the filament side of the cusp has been determined to be about 75 eV and on the aperture side about 12 eV. Since the electron impact cross section for ionizing diatomic deuterium is maximum at 75 eV and the cross section for dissociating $D^+_2$ to $D^+$ is greatest near 12 eV, we believe that a very effective two-step ionization process accounts for the high $D^+$ yield of the single-ring magnetic cusp source. Plasma potentials measured have values close to the voltage of the anode, and the floating potentials are seen to be directly related to electron energy values. The floating potential is near cathode voltage where electron energies are high, and close to anode voltage where electron energies are low.

3558 **Measurement of vibration-rotation line strengths of HO using a tunable diode laser.** Podolske, J.R.; Johnston, H.S. (Department of Chemistry and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **79**: No. 8, 3633-3638(15 Oct 1983).

Line strengths were measured for four transitions of the HO radical near 2.93 μm in the fundamental vibration-rotation band using a tunable infrared diode laser coupled to a molecular modulation spectrometer. The hydroxyl radical was produced by modulated photolysis of $O_3$ at 2537 A in the presence of $H_2O$, and its number density obtained from numerical simulation of the complete photochemical system. The strongest line observed was at 3407.607 cm$^{-1}$ with a measured line strength of 3.3 +- 1.5 x 10$^{-20}$ cm$^2$ molecule$^{-1}$ cm$^{-1}$.

**3559 System-bath decomposition of the reaction path Hamiltonian. II. Rotationally inelastic reactive scattering of $H+H_2$ in three dimensions.** Schwartz, S.D.; Miller, W.H. (Department of Chemistry and Materials and Molecular Research Division of the Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **79**: No. 8, 3759-3764(15 Oct 1983).

Earlier work of the authors [J. Chem. Phys. 77, 2378 (1982)] has shown how the reaction path Hamiltonian of Miller, Handy, and Adams [J. Chem. Phys. 72, 99 (1980)] can be divided into a "system" of the reaction coordinate and modes strongly coupled to it, plus a "bath" of more weakly coupled modes. Quantum mechanical perturbation theory was used to show how one can combine an exact description of the system dynamics with an approximate (perturbative) treatment of the effect of the bath. The present paper applies this approach to the 3d $H+H_2$ reaction, where the two collinear degrees of freedom constitute the system, and the two bending modes the bath. Comparison with the accurate scattering calculations of Schatz and Kupermann [J. Chem. Phys. 65, 4668 (1976)] shows it to provide a good description of the coupling between bending (i.e., rotational) and collinear modes.

**3560 Classification of doubly excited states of two-electron atoms.** Lin, C.D. (Physics Department, Kansas State University, Manhattan, Kansas 66506). *Physical Review Letters;* **51**: No. 15, 1348-1351(10 Oct 1983).

Based upon the analysis of electron correlations in hyperspherical coordinates, a classification scheme for all doubly excited states of two-electron atoms is presented. A new set of correlation quantum numbers, K, T, and A, is introduced, where (K,T) describes angular correlations and A describes radial correlations. It is shown that states with different L, S, and $\pi$ but identical (K,T)/sup A/ have isomorphic correlations. Such isomorphism is shown to result in the general supermultiplet structure of doubly excited states.

**3561 First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles.** Breinig, M.; Dixon, G.J.; Engar, P.; Elston, S.B.; Sellin, I.A. (University of Tennessee, Knoxville, Tennessee 37996 and Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review Letters;* **51**: No. 14, 1251-1254(3 Oct 1983). Contract W-7405-ENG-26.

Energy spectra of protons emerging near the forward direction for 100—300-eV/u $Ar^+$ beams incident on $CH_4$ were recorded. Cross sections for the capture of H atoms from $CH_4$ molecules into states lying in the vibrational continuum of the electronic ground state and into predissociative states of $ArH^+$ molecules were measured as a function of projectile energy. Capture occurs via the Thomas double-scattering mechanism.

**3562 Chaos in multiple-photon excitation of molecules.** Ackerhalt, J.R.; Galbraith, H.W.; Milonni, P.W. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters;* **51**: No. 14, 1259-1261(3 Oct 1983).

With use of a Hamiltonian model system to represent ir laser excitation of a molecule it is shown that chaos is a fundamental aspect of this physical process. On average the chaos leads to a fluence-dependent absorption which previously was attributed to rapid statistical equilibration of energy in the quasicontinuum and was modeled by population rate equations. The origin of the chaos is the interplay of the pump mode's anharmonicity and intramolecular energy transfer.

**3563 Reaction-path dynamics for polyatomic systems.** Miller, W.H. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **87**: No. 20, 3811-3819(29 Sep 1983). Contract AC03-76SF00098.

Recent advances in computational quantum chemistry are making it increasingly feasible to determine the minimum-energy paths for polyatomic reaction processes. (This is the steepest descent path, in mass-weighted Cartesian coordinates, through a transition state from reactants to products). This paper reviews a methodology for basing a reaction dynamics on such a reaction path (plus harmonic fluctuations about it). Some of the applications of the approach are discussed, as well as its generalizations and extensions. 3 figures.

**3564 Observation of solitons in stimulated Raman scattering.** Druehl, K.; Wenzel, R.G.; Carlsten, J.L. (Institute for Modern Optics, University of New Mexico, Albuquerque, New Mexico 87131). *Physical Review Letters;* **51**: No. 13, 1171-1174(26 Sep 1983).

Anomalous pump-depletion reversal in stimulated Raman scattering has been observed, and is interpreted as the development of a soliton induced by a random phase shift in the injected stokes beam. The experimental findings are presented and compared with the analytical solutions to the undamped stimulated Raman scattering equations as well as with a numerical study of the damped equations.

**3565 Measurement of the branching ratio for the dissociative recombination of $H_3i+e$.** Mitchell, J.B.A.; Forand, J.L.; Ng, C.T.; Levac, D.P.; Mitchell, R.E.; Mul, P.M.; Claeys, W.; Sen, A.; McGowan, J.W. (Department of Physics and the Centre for Chemical Physics, University of Western Ontario, London, Ontario N6A3K7, Canada). *Physical Review Letters;* **51**: No. 10, 885-888(5 Sep 1983).

The dissociative recombination of $H_3^+$ with electrons can have two exit channels, namely $e+H_3^+ \rightarrow H+H+H$ (Channel I), and $e+H_3^+ \rightarrow H_2+H$ (channel II). A new technique has been developed which has been used to determine the relative contributions of channels I and II to the overall recombination process. Over the energy range from 0.01 to 0.50 eV it has been found that Channel I dominates.

**3566 Revised $3p^63d^8\ ^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII.** Reader, J.; Ryabtsev, A. (National Bureau of Standards, Washington, DC 20234). *Journal of the Optical Society of America;* **73**: No. 9, 1207-1208(Sep 1983).

Following an observation by Wyart et al. [Phys. Scr. 26, 141 (1982)], we have revised the position of the $3p^63d^8\ ^1S_0$ level in Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII and have redetermined the $3p^63d^8$ energy parameters in these ions.

**3567 Dependence of multiple-scattering distributions on the charge states of fast ions exiting from solid targets.** Kanter, E.P. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review* [*Section*] *A: General Physics;* **28**: No. 3, 1401-1404(Sep 1983). Contract W-31-109-ENG-38.

Measurements are reported on the multiple-scattering widths for 1—4-MeV $N^+$ projectiles in thin carbon targets as a function of the charge state of the outgoing ion. Evidence is found for a significant enhancement of the angular widths for K-vacancy—bearing emergent ions. A quantitative model is proposed demonstrating how the "memory" of K-vacancy—producing collisions can give rise to such an enhancement despite apparent charge-state equilibration.

**3568 Concerning a long-lived ($^3$P/sup e/)$He^-$ state: Lifetime and energy-level measurements of $He^-$.** Alton, G.D.; Compton, R.N.; Pegg, D.J. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *A: General Physics;* **28**: No. 3, 1405-1412(Sep 1983).

The question concerning the existence of a long-lived doublet ($^3$P/sup e/)$He^-$ state has been addressed by measuring the lifetime and energies of autodetaching electrons from 20—120-keV $He^-$-ion beams formed by charge exchange in Ca vapor: a vapor conducive with ($^3$P/sup e/)$He^-$ formation. The measured lifetime and electron energy levels agree closely with accepted values for components of the ($^4$P/sub J//sup o/)$He^-$ states. No other structures were detected in the electron energy spectrum encompassing the anticipated energy level of the autodetached electron from the ($^3$P/sup e/)$He^-$ state.

3569 **Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules.** Phaneuf, R.A. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1310-1314(Sep 1983).

Total electron-capture cross sections have been measured for collisions of Fe/sup q/+ ions (3< or =q< or =14) with H and $H_2$ at energies in the 10—95 eV/amu range. The cross sections increase approximately linearly with increasing ionic charge q, and, for atomic hydrogen, can be represented by the empirical formula: $\sigma = q \times 10^{-15}$ cm² with an rms deviation of +- 26%. For $Fe^{5+}$ and $Fe^{6+}$, for which higher-energy data exist, the cross sections are found to be essentially energy independent over the range 17<E<2000 eV/amu. The cross sections for an atomic H target average 26% larger than for $H_2$. Agreement with generalized theoretical models is within a factor of 2 or better.

3570 **Theoretical triply differential cross section of electron-impact ionization of atoms.** Huang, K. (Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1869-1872(Sep 1983).

The triply differential cross section of the electron-impact ionization of atoms is given in a parametrized form, suitable for theoretical computations or for semiempirical fittings. Application of the present formulation is demonstrated. Merits of coplanar measurements are discussed. It is also shown that the coplanar up-down asymmetry of the ejected electron is linear in the scattering angle, or the momentum transfer, of the incident electron for small momentum transfers.

3571 **Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma.** Wang, J.C.; Caro, R.G.; Harris, S.E. (Edward L. Ginzton Laboratory, Stanford University, Stanford, California 94305). *Physical Review Letters;* **51**: No. 9, 767-770(29 Aug 1983).

As a result of photoionization of rare-gas atoms by x-rays emitted from a laser-produced plasma, high densities ($>10^{16}$ cm$^{-3}$) of hot (~45-eV) electrons are produced in a pulse of ~600 ps duration. Following excitation by means of this electron source, the deexcitation rate constant from the Li (1s2s2p) $^4P^0$ level is measured to be 3 x $10^{-7}$ cm$^3$ s$^{-1}$ at an electron density of $\sim 10^{15}$ cm$^{-3}$.

3572 **Shape functions for atomic-field bremsstrahlung from electrons of kinetic energy 1—500 keV on selected neutral atoms 1< or =Z< or =92.** Kissel, L.; Quarles, C.A.; Pratt, R.H. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Atomic Data and Nuclear Data Tables;* **28**: No. 3, 381-460(May 1983). Contract AC04-76DP00789.

A tabulation is presented of theoretical predictions for the shape functions for atomic-field bremsstrahlung for 24 atoms with atomic number Z ranging from 1 to 92 for six incident electron energies $T_1$ from 1 to 500 keV. The shape function is defined as the ratio of the bremsstrahlung cross section differential in photon energy and angle to the photon energy spectrum. Shape functions have been tabulated for photon angles from 0° to 180° in 5° intervals for 12 values of the fraction of energy radiated $k/T_1$ from 0 to 1.0. The tables for 2< or =Z< or =92 result from interpolations in a tomic number and fraction of energy radiated from a set of benchmark data calculated by treating the bremsstrahlung process as a single-electron transition in a relativistic self-consistent screened potential. The table for Z = 1 is calculated using a screened Born approximation.

3573 **Resonant multiphoton ionization of $H_2$ via the B $^1\Sigma^+$/sub u/, v = 7, J = 2 and 4 levels with photoelectron energy analysis.** Pratt, S.T.; Dehmer, P.M.; Dehmer, J.L. (Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **78**: No. 7, 4315-4320(1 Apr 1983). Contract W-31-109-ENG-38.

We report measurements of photoelectron spectra of an electronically excited state of $H_2$ (B $^1\Sigma^+$/sub u/) in selected vibrational and rotational levels. The excited state was prepared by resonant three photon excitation of $H_2$ X $^1\Sigma^+$/sub g/, v = 0, J = 3 and subsequently was ionized by a single additional photon. Partially resolved rotational structure is observed in the photoelectron spectra and is discussed in terms of the selection rules for direct photoionization and the partial wave composition of the ejected photoelectrons. An additional peak is observed in the spectra, which is tentatively interpreted as arising from photoionization of H*(n = 2) formed by photodissociation of $H_2$ in the B $^1\Sigma^+$/sub u/ state.

3574 **Auger spectra of tetrahedral halides and hydrides.** Rye, R.R.; Houston, J.E. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Chemical Physics;* **78**: No. 7, 4321-4330(1 Apr 1983).

Auger electron spectra are presented for the gas-phase molecular species $CF_4$, $SiF_4$, $CCl_4$, and $SiCl_4$ and discussed in terms of the effect of the interaction of the two final-state holes on the spectral line shapes. The highly polar character of the bonding for this series leads to systematic behavior with respect to this hole—hole interaction, showing rare gas-like localized halide spectra for $SiF_4$ and a delocalized component of increasing intensity as we proceed through the series to $SiCl_4$, $CF_4$, and $CCl_4$. The central atom spectra show a composite line shape resulting from the sum of two versions of the same one-electron final states but with different values of U (the hole—hole interaction energy). The Auger process occurs as a result of the electron density available at the central atom site but, since the one-electron orbitals are highly polarized towards the halide, the two holes principally appear around the halide sites. With both holes on the same halide site a rather large U results, but with the two holes on separate halide sites one obtains a reduced value of U. The relative intensity of the smaller U component appears to increase as we proceed through the series $SiF_4$, $SiCl_4$, $CF_4$, and $CCl_4$. This tendency in both the halide spectra and in the central atom spectra depends on the strength of the intersite interaction. The molecular parameter which seems most reasonable to predict this division between localized and delocalized behavior is the ratio of the halide—halide distance to the halide radius. In addition, we demonstrate that for a rather extended series of molecular species the trends in the value of U can be predicted surprisingly well on the basis of an experimental value of U for Ne and the known atomic and molecular dimensions. The implications of this simple predictive capability to other molecular systems is discussed.

3575 **Exact scattering solutions in an energy sudden (ES) representation.** Chang, B.; Eno, L.; Rabitz, H. (Department of Chemistry, Princeton University, Princeton, New Jersey 08544). *Journal of Chemical Physics;* **78**: No. 7, 4477-4485(1 Apr 1983).

In this paper, we lay down the theoretical foundations for computing exact scattering wave functions in a reference frame which moves in unison with the system internal coordinates. In this frame the (internal) coordinates appear to be fixed and its adoption leads very naturally (in zeroth order) to the energy sudden (ES) approximation [and the related infinite order sudden (IOS) method]. For this reason we call the new representation for describing the exact dynamics of a many channel scattering problem, the ES representation. Exact scattering solutions are derived in both time dependent and time independent frameworks for the representation and many interesting results in these frames are established. It is shown, e.g., that in a time dependent frame the usual Schroedinger propagator factorizes into internal Hamiltonian, ES, and energy correcting propagators. We also show that in a time independent frame the full Green's functions can be similarly factorized. Another important feature of the new representation is that it forms a firm foundation for seeking corrections to the ES approximation. Thus, for example, the singularity which arises in conventional perturbative expansions of the full Green's functions (with the ES Green's function as the zeroth order solution) is avoided in the ES representation. Finally, a number of both time independent and time dependent ES correction schemes are suggested.

3576 **Magic numbers for argon and nitrogen cluster ions.** Friedman, L.; Beuhler, R.J. (Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973). *Journal of Chemical Physics;* **78**: No. 7, 4669-4675(1 Apr 1983).

Evidence for the existence of magic numbers for cluster ions of argon atoms and nitrogen molecules has been found with high molecular weight mass spectra of their cluster ions. The observed

numbers of 145, 303, 550, and 912 in mass spectra of cluster ions coincides within experimental error limit with the number of particles required for complete shell icosahedra. Failure to observe similar magic number structures in mass spectra of polyatomic molecule cluster ions and differences between polyatomic molecule cluster ion mass spectra and the argon and nitrogen cluster ion spectra are discussed.

3577 **Comment on ab initio calculation of spin densities in hydrocarbon radicals.** Chipman, D.M. (Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana 46556). *Journal of Chemical Physics;* **78**: No. 7, 4785-4786(1 Apr 1983).

An earlier calculation of hydrocarbon radical hyperfine coupling constants, using the spin-projected unrestricted Hartree Fock (PuHF) method is updated. Unprojected uHF calculations are performed for all the systems studied before. (AIP)

3578 **Theoretical considerations associated with the production of negative ions in sputter-type ion sources.** Alton, G.D. (Oak Ridge National Lab, Oak Ridge, TN 37830). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **30**: No. 2, 1480-1490(Apr 1983). Contract W-7405-ENG-26.

Processes which are important to the optimum formation of negative ions by sputtering in the presence of an alkali metal are discussed. Negative ion generation probabilities calculated from several theoretical models including the tunneling, Norskov and Lundqvist, "freezing" approximation of Overbosch and Los as well as modified surface ionization theories are compared with experimental observation. An analytical expression is introduced which reproduces with good accuracy observed maximum work function changes for electropositive adsorbates on metallic adsorbants. The expression is extremely useful for computing the value of the work function at its minimum which in turn can be used in the appropriate model for computing optimum negative ionization probabilities.

3579 **Centrifugal distortion and internal rotation analysis of the microwave spectrum of ethyl fluoride.** Fliege, E.; Dreizler, H.; Demaison, J.; Boucher, D.; Burie, J.; Dubrulle, A. (Abteilung Chemische Physik, Institut fuer Physikalische Chemie der Universitaet Kiel, D 2300 Kiel, West Germany). *Journal of Chemical Physics;* **78**: No. 6, 3541-3544(15 Mar 1983).

The internal rotation fine structure of the microwave spectrum of ethyl fluoride $CH_3CH_2F$ was resolved and analyzed in the ground state. The assignment of the high J lines was checked by a centrifugal distortion analysis. The barrier height $V_3$ determined from the ground state is 3349 +- 4 cal/mol.

3580 **Two-photon excitation of the D $^1m$—X $^1\Sigma^+$ transition in carbon monoxide.** Kittrell, C.; Cameron, S.; Butler, L.; Field, R.W.; Barrow, R.F. (Department of Chemistry and George Harrison Spectroscopy Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Journal of Chemical Physics;* **78**: No. 6, 3623-3624(15 Mar 1983).

A frequency doubled pulsed dye laser is used to promote two-photon excitation of the $D^1\Delta$-$X^1\Sigma^+$ transition in carbon monoxide. Collisional transfer to $A^1Pi$ leads to ultraviolet fluorescence which is detected with a solar blind photomultiplier. Rotationally resolved structure belonging to bands of three isotopically substituted molecules has been measured relative to the visible spectrum of iodine. Preliminary values of molecular constants are given.

3581 **Semiclassical inversion procedure for the dipole-moment function for diatomic molecules.** Stine, J.R.; Noid, D.W. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **78**: No. 6, 3647-3651(15 Mar 1983).

A simple formalism is presented to deduce the dipole moment as a function of internuclear distance from experimental vibrational intensity data. This method, like the RKR method for obtaining the potential-energy function, is based on the semiclassical WKB formalism and no particular functional form need be assumed for the dipole moment. The method is applied to the experimental data of Sileo and Cool for HF.

3582 **$^2Pi$←X $^2\Sigma^+$ infrared electronic transition of $C_2H$.** Carrick, P.G.; Merer, A.J.; Curl, R.F. Jr. (Chemistry Department and the Rice Quantum Institute, Rice University, Houston, Texas 77251). *Journal of Chemical Physics;* **78**: No. 6, 3652-3658(15 Mar 1983).

Five bands of the A $^2Pi$←X $^2\Sigma^+$ lowest electronic transition of $C_2H$ have been observed in the region 3600—4200 $cm^{-1}$ in an argon discharge over polyacetylene using color center laser spectroscopy with magnetic rotation sensitivity enhancement. The band origins are approximately 3692, 3773, 3785, 4011, and 4106 $cm^{-1}$. Rotational assignments and preliminary fittings of all five bands have been made. Four of the bands have a $^2\Sigma^+$ lower vibronic state which is undoubtedly the ground vibronic state of the molecule, and different $^2Pi$ upper vibronic states which correspond to mixtures of the lowest vibronic state of the A electronic state and three different vibrationally excited levels of the X electronic state with an odd number of quanta in the bending mode and overall $^2Pi$ symmetry. These three ground state vibrational levels have been tentatively assigned as (1,1,0), (0,1,2), and (0,5,1). The four $^2Pi$ vibronic levels are mixed by vibronic coupling between the X and A electronic states thereby providing electronic oscillator strength for the vibrational transitions. The fifth band is a $^2\Sigma^-$←$^2Pi$ hot band with the lower state the first excited bending level (0,1,0) of the ground electronic state and upper state the $^2\Sigma^-$ component of the (0,1,0) excited bending level of the excited electronic state. From these observations a value of 1.30 A for the CC bond length in the excited electronic state and a value of ~375 $cm^{-1}$ for the bending frequency of the X ground electronic state are obtained.

3583 **Unimolecular and bimolecular reactions in the $C_4H_6$/sup +center-dot/ system: Experiment and theory.** Jarrold, M.F.; Bass, L.M.; Kemper, P.R.; van Koppen, P.A.M.; Bowers, M.T. (Department of Chemistry, University of California, Santa Barbara, California 93106). *Journal of Chemical Physics;* **78**: No. 6, 3756-3766(15 Mar 1983).

New experimental data on the metastable reactions of $C_4H_6$/sup +center-dot/ are presented. The bimolecular reactions between $C_2H_3$/sup +center-dot/ and $C_2H_4$ and between $C_2H_4$/sup +center-dot/ and $C_2H_3$ have been reinvestigated using a tandem ICR. Total rate constants and branching ratios were measured and isotopic scrambling investigated using deuterium labeling. The experimental data reported here and the PIPECO data of Werner and Baer [J. Chem. Phys. 62, 2900 (1975)] are compared with the predictions of the transition state switching model. Good agreement was found between the predictions of the model and the experimental data. The branching ratios were found to be strong functions of both energy and angular momentum. In the bimolecular reaction between $C_2H_3^+$ and $C_2H_4$ charge transfer appears to occur predominently via a loosely bound intermediate which only samples a small volume of the available $C_4H$/sup +center-dot/$_6$ phase space.

3584 **Complete energy transfer map for $COF_2$ .** Ahl, J.L.; Bohn, R.K.; Casleton, K.H.; Rao, Y.V.C.; Flynn, G.W. (Department of Chemistry and Columbia Radiation Laboratory, Columbia University, New York, New York 10027). *Journal of Chemical Physics;* **78**: No. 6, 3899-3906(15 Mar 1983).

Fluorescence from the $\nu_1$, $\nu_4$, $\nu_6$, and $\nu_3/\nu_5$ states has been observed following Q-switched $CO_2$ laser excitation of the $\nu_2$ C—F stretch mode of $COF_2$. A kinetic model is presented which is consistent with the observed fluorescence lifetimes. Following excitation of the $\nu_2$ mode, $2\nu_2$ is rapidly pumped by ladder climbing collisions. The $2\nu_2$ states are collisionlessly coupled to the $\nu_1$ mode by Fermi resonance leading to the creation of a steady state between the $\nu_1$ and $\nu_2$ manifolds within 30 gas kinetic collisions. Subsequently, the $\nu_2$ state decays to the $\nu_6$ mode in 800 collisions, and also fills the $\nu_4$ mode in 2000 gas kinetic collisions. The $\nu_4$ level rapidly equilibrates with the near resonant states $2\nu_3$, $2\nu_5$, and $\nu_3+\nu_5$ after about 25 collisions, and these states rapidly decay to the $\nu_3$ and $\nu_5$ fundamentals in less than or about 100 collisions. The $\nu_6$ state relaxes to the $\nu_3/\nu_5$ states, in approximately 190 collisions, while vi-

bration-translation/rotation relaxation of $\nu_3$ and $\nu_5$ to the ground state occurs on a time scale of 1200 collisions.

3585 **Comparison of quantal, classical, and semiclassical behavior at an isolated avoided crossing.** Noid, D.W.; Koszykowski, M.L.; Marcus, R.A. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Journal of Chemical Physics;* **78**: No. 6, 4018-4024(15 Mar 1983).

The quantal and classical/semiclassical behavior at an isloated avoided crossing are compared. While the quantum mechanical eigenvalue perturbation parameter plots exhibit the avoided crossing, the corresponding primitive semiclassical eigenvalue plots pass through the intersection. Otherwise, the eigenvalues agree well with the quantum mechanical values. The semiclassical splitting at the intersection is calculated from an appropriate Fourier transform. In the quasiperiodic regime, a quantum state near an avoided crossing is seen to exhibit typically more delocalization than the classical state. However, trajectories near the "separatrix" display a quasiperiodic "transition" between two zeroth order classical states.

3586 **Molecular clustering about a positive ion. Structures, energetics, and vibrational frequencies of the protonated hydrogen clusters $H^+a$, $H^+_5$, $H^+_7$, and $H^+_9$.** Yamaguchi, Y.; Gaw, J.F.; Schaefer, H.F. III. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **78**: No. 6, 4074-4085(15 Mar 1983).

The positive hydrogen clusters $H^+(H_2)$/sub n/ for n = 1, 2, 3, 4 have been studied via nonempirical molecular electronic structure theory. Using double zeta (DZ) and double zeta plus polarization (DZ+P) basis sets, wave functions are reported at both the self-consistent field (SCF) and configuration interaction including all single and double excitations (CISD) levels of theory. In each case analytic gradient techniques have been used to locate stationary point geometries and to predict harmonic vibrational frequencies. The effects of electron correlation are shown to be greater for these loose molecular complexes than for ordinary molecules. Although $H^+_5$ in its lowest energy conformation is not qualitatively described as $H^+_3xH_2$, the larger molecular ions do fit the qualitative picture $H^+_3(H_2)$/sub n/, with $H^+_3$ as a nucleating center. Of special interest here are the "new" normal modes of these clusters, i.e., those modes having no counterpart in the isolated $H^+_3$ or $H_2$ species. There are 15 such vibrational degrees of freedom for $H^+_9$, and the resulting harmonic vibrational frequencies range from 775 $cm^{-1}$ all the way down to 63 $cm^{-1}$. Dissociation energies as a function of cluster size follow the pattern established experimentally by Hiraoka and Kebarle.

3587 **Distribution of internal energy in CO and $CO_2$ vibrationally excited by a hot platinum surface.** Mantell, D.A.; Ryali, S.B.; Haller, G.L.; Fenn, J.B. (Department of Chemical Engineering, Yale University, New Haven, Connecticut 06520). *Journal of Chemical Physics;* **78**: No. 6, 4250-4255(15 Mar 1983).

Changes in the internal state of CO and $CO_2$ molecules scattered by a hot platinum surface have been characterized by Fourier transform infrared emission spectroscopy. The only molecules which can be detected are those that are vibrationally excited for CO and excited to the asymmetric stretch mode for $CO_2$. The distribution of rotational energy in these molecules is Boltzmann for $CO_2$ but not for CO. In both cases, the rotational energy is substantially less than the equilibration values based on the surface temperature. The accommodation coefficient for the asymmetric stretch vibrational mode of $CO_2$ drops from 0.22 at 700 K to 0.16 at 1500 K. Very few of the molecules which are vibrationally excited in the asymmetric stretch mode are also excited in either the bending or symmetric stretch mode. For CO, the vibrational accommodation coefficient is about 0.7. However, the fraction of the molecules excited to the v = 2 vibrational level compared to the v = 1 level indicates complete vibrational accommodation at the surface temperature. This implies a partitioning of CO molecules between those that completely accommodate vibrationally and those that do not accommodate at all.

3588 **Supersonic copper clusters.** Powers, D.E.; Hansen, S.G.; Geusic, M.E.; Michalopoulos, D.L.; Smalley, R.E. (Rice Quantum Institute and Department of Chemistry, Rice University, Houston, Texas 77251). *Journal of Chemical Physics;* **78**: No. 6, 2866-2881(15 Mar 1983).

Copper clusters ranging in size from 1 to 29 atoms have been prepared in a supersonic beam by laser vaporization of a rotating copper target rod within the throat of a pulsed supersonic nozzle using helium for the carrier gas. The clusters were cooled extensively in the supersonic expansion [T(translational) 1 to 4 K, T(rotational) = 4 K, T(vibrational) = 20 to 70 K]. These clusters were detected in the supersonic beam by laser photoionization with time-of-flight mass analysis. Using a number of fixed frequency outputs of an exciplex laser, the threshold behavior of the photoionization cross section was monitored as a function of cluster size.nce two-photon ionization (R2PI) with mass selective detection allowed the detection of five new electronic band systems in the region between 2690 and 3200 A, for each of the three naturally occurring isotopic forms of $Cu_2$. In the process of scanning the R2PI spectrum of these new electronic states, the ionization potential of the copper dimer was determined to be 7.894 +- 0.015 eV.

3589 **Theory of surface enhanced Raman scattering.** Arunkumar, K.A.; Bradley, E.B. (Department of Electrical Engineering, University of Kentucky, Lexington, Kentucky 40506). *Journal of Chemical Physics;* **78**: No. 6, 2882-2888(15 Mar 1983).

It is now generally accepted that more than one mechanism could be at work in enhancing the Raman signal from molecules adsorbed onto a rough surface. In this paper we present a simple surface coverage, surface roughness dependent model that accounts for one such mechanism. According to our model, each adsorbate is subjected to both polarizing and depolarizing fields from its oscillating neighbors. Competition between these two fields is shown to determine the magnitude of signal enhancement.

3590 **Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices.** Foosnaes, T.; Pellin, M.J.; Gruen, D.M. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **78**: No. 6, 2889-2898(15 Mar 1983).

Three molybdenum—dinitrogen complexes [$MoN_2$,Mo/sub x/($N_2$) and $Mo(N_2)_3$] have been synthesized in Kr matrices and characterized by means of the effects of isotopic substitution on the dinitrogen stretching frequencies. The Mo—N force constants calculated from these spectra are found to be 17.21 +- 0.02 mdyn/A for $MoN_2$ and f/sub r/ = 18.72 mdyn/A and f/sub r/r = 0.36 mdyn/A for $Mo(N_2)_3$. The Mo complexes appear to be unique in that rapid formation during co-deposition with $N_2$ occurs only upon photoexcitation of the Mo $^7S$—$^7P$ atomic resonance transition situated at 355 nm in Kr matrices. Although minor amounts of the dinitrogen complexes are formed during deposition in the absence of radiation, their concentration is not increased by thermal annealing. Each of the complexes gives rise to its own electronic absorption spectrum. Irradiation into the electronic absorption bands of individual complexes induced selective photodissociation. Photoinduced growth and decomposition studies allowed correlations to be made between the vibrational and corresponding electronic spectra.

3591 **Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$.** Holland, R.F.; Maier, W.B. II. (University of California, Los Alamos National Laboratory, Chemistry Division, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **78**: No. 6, 2928-2941(15 Mar 1983).

Infrared absorption spectra of nitrogen oxides present when NO and $NO_2$ are dissolved in liquid xenon between 160 and 220 K have been measured. Spectral absorptions of NO, $NO_2$, $(NO)_2$, $N_2O_4$, and $N_2O_3$ are identified, and integrated absorption cross sections are given for several spectral features. The spectra suggest that symmetric $N_2O_3$ and asymmetric $N_2O_3$ are in equilibrium in solution and that the energy difference between these two isomers is 1.8 +- 0.2 kcal/mol.

**3592 Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr.** Chu, J.O.; Flynn, G.W.; Weston, R.E. Jr. (Department of Chemistry and Columbia Radiation Laboratory, Columbia University, New York, New York 10027). *Journal of Chemical Physics;* **78**: No. 6, 2990-2997(15 Mar 1983).

193 nm photofragmentation of HBr molecules in $HBr/CO_2$ mixtures produces energetic (~2.5 eV) hydrogen atoms which vibrationally excite $CO_2$ molecules via an inelastic translation-vibration/rotation (T-V/R) energy exchange process. Prompt infrared emission in the 4.3 μm region has been wavelength resolved, and the spectral energy distribution associated with the excited $CO_2$ product was measured. The emission profile is strongly red shifted from the spectral region of the $\nu_3$ ($00^01$—$00^00$) fundamental transition indicating that these energetic collisions preferentially produce combination and overtone levels with oscillator strength in the 4.3 μm region. Cold gas filter studies show that significant emission originates from $CO_2$ bend—stretch excitation compared to pure stretching excitation. Approximately 15% of the emission is due to the $01^11$—$01^10$ transition while the remaining fluorescence has contributions from levels above the $01^11$ state. The data are in qualitative agreement with theoretical calculations on $O/CO_2$ collisions employing either quasiclassical trajectory or infinite order sudden methods, but do not agree with predictions based upon either (harmonic oscillator) breathing sphere theory or statistical theory.

**3593 Validity of the energy sudden approximation.** Chang, B.; Eno, L.; Rabitz, H. (Department of Chemistry, Princeton University, Princeton, New Jersey 08544). *Journal of Chemical Physics;* **78**: No. 6, 3027-3031(15 Mar 1983).

This paper contains an examination of the conditions under which the energy sudden (ES) approximation may be expected to be valid. Our approach involves using dimensional analysis to identify (dimensionless) quantities which control energy suddenness and in this fashion three sets of ES criteria emerge. One involves the relative kinetic energy between collision partners and the energy spacing of the internal states of interest; another the strength of the coupling interaction and the same spacing; and a third involves the masses of the colliding molecules and component atoms. We discuss the relationship between these conditions and the justifications given by earlier workers for adopting the ES approximation and then the mass conditions in particular are used as the basis for certain broad statements concerning the applicability of the ES method within nonreactive diatom—diatom and reactive atom—diatom collisions. Finally, a number of avenues for further development of this work are discussed.

**3594 Tests of the quasiclassical trajectory cross-correlation moment method against accurate quantum dynamics for V—V energy transfer in HF—HF collisions.** Schwenke, D.W.; Thirumalai, D.; Truhlar, D.G.; Coltrin, M.E. (Department of Chemistry and Chemical Physics Program, University of Minnesota, Minneapolis, Minnesota 55455). *Journal of Chemical Physics;* **78**: No. 6, 3078-3083(15 Mar 1983).

. V—V energy transfer probabilities for breathing—sphere HF—HF collisions are calculated both by a quasiclassical trajectory moment analysis and by converged quantal close coupling calculations. The two methods agree within factors of 1.1—1.5 for transition probabilities greater than or equal to 0.17 and within factors of 1.9—9.5 for transition probabilities in the range 0.04—0.065, but only within factors of 5.1—82 for those in the range 0.0008—0.004 and within factors of 20—150 for those in the range 0.0002—0.0004.

**3595 Theoretical study of the properties of methyl radical.** Chipman, D.M. (Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana 46556). *Journal of Chemical Physics;* **78**: No. 6, 3112-3132(15 Mar 1983).

A detailed ab initio study of the structure and properties of methyl radical in its ground electronic state is presented. The primary focus is on the spin density distribution and its dependence on basis set, wave function model, and molecular geometry. By using a natural orbital analysis that provides an unambiguous decomposition into core and valence contributions, interesting theoretical and computational results are found that clarify the relationships among CI, UHF, and PUHF models. In particular, it appears that the better agreement with experiment for the PUHF model as compared to UHF is simply fortuitous. A large and negative core contribution found in the $^{13}C$ isotropic hyperfine coupling constant explains why minimal basis set calculations always greatly overestimate this property, regardless of what wave function model is used. All the models studied give good results for anisotropic hfc and for the vibrational corrections to isotropic hfc, although not for the isotropic hfc themselves. Through comparison to the ab initio results, some conditions are revealed where semiempirical methods such as INDO should fail. The dependence of potential energy and various charge density properties on molecular geometry is also studied.

**3596 Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br).** Papatheodorou, G.N.; Curtiss, L.A.; Maroni, V.A. (Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **78**: No. 6, 3303-3315(15 Mar 1983).

Raman spectra of gaseous $NH_3$:$AlCl_3$ and $NH_3$:$AlBr_3$ were recorded at 400 °C. The observed Raman frequencies in combination with reported infrared frequencies for $NH_3$:$AlCl_3$ and ab initio molecular orbital calculations on $NH_3$:$AlCl_3$ and $NH_3$:$AlF_3$ were used to derive force constants for all three $NH_3$:$AlX_3$ complexes (X = F, Cl, Br) based on an adjusted valence force field (AVFF) concept. The resulting force constant calculations produced complete sets of $A_1$ and E mode frequencies for each complex. Statistical mechanical analyses were then performed using the $A_1$ and E mode frequencies together with estimated values for the torsional mode of each complex and published enthalpy data. From these analyses, the relative thermodynamic stability of each complex was determined. At 700 and 1000 K, $NH_3$:$AlCl_3$ was found to be more stable than $NH_3$:$AlBr_3$. It was further predicted that the reaction of gaseous $NH_3$ with solid $AlF_3$ to form $NH_3$:$AlF_3$ is not favored in this temperature range, which provides an explanation for the lack of success in prior efforts to produce $NH_3$:$AlF_3$.

**3597 $3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$.** Reader, J. (National Bureau of Standards, Washington, D.C. 20234). *Journal of the Optical Society of America;* **73**: No. 1, 63-65(Jan 1983).

The $3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in the cobaltlike ions $Ba^{29+}$, $La^{30+}$, $Nd^{33+}$, $Sm^{35+}$, $Gd^{37+}$, $Dy^{39+}$, $Er^{41+}$, and $Yb^{43+}$ were observed with a laser-produced plasma and a 2.2-m grazing-incidence spectrograph. Predicted wavelengths were obtained for the $3p^6\,3d^9\ ^2D/$sub 5/2/-2D/sub 3/2/ magnetic dipole transitions in $Mo^{15+}$, $Xe^{27+}$, and $W^{47+}$.

**3598 Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42.** Victor, G.A.; Taylor, W.R. (Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, Massachusetts 02138). *Atomic Data and Nuclear Data Tables;* **28**: No. 1, 107-214(Jan 1983). Contract AC02-76ER02887.

Semiempirical model-potential methods are used to calculate energy levels, wavelengths, and oscillator strengths for the copper and zinc isoelectronic sequences out to Mo XIV and Mo XIII, respectively.

**3599 Isotope effect in electron-capture differential cross sections at intermediate energies.** Rille, E.; Olson, R.E.; Peacher, J.L.; Blankenship, D.M.; Kvale, T.J.; Redd, E.; Park, J.T. (Physics Department, University of Missouri-Rolla, Rolla, Missouri 65401). *Physical Review Letters;* **49**: No. 25, 1819-1821(20 Dec 1982).

The isotope dependence in the angular distribution of electron-capture cross sections for protons and deuterons with equal velocity (E = 40 keV/u) colliding with atomic hydrogen or deuterium targets is predicted theoretically and observed experimentally. A projectile-dependent effect is observed at small scattering angles. No target dependence was detected in the differential cross sections. A scaling relationship is determined which permits the prediction of differential cross sections for hydrogen-isotope projectiles.

3600 **Optogalvanic response to light: photon energy vs photon number; comments.** Keller, R.A.; Zalewski, E.F. (University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Applied Optics;* **21**: No. 22, 3992(15 Nov 1982).

This Letter is a rebuttal of Kopeika's criticsm of our paper. To summarize the important points: We claimed that the magnitude of the optogalvanic effect (OGE) in U, Na, Eu, and Zr was independent of the ionization potential of the atom and depended on only the number of photons absorbed. Both mechanisms, increased electron temperature and direct ionization, undoubtably proceed simultaneously and the relative importance of one or the other probably depend on the experimental conditions. Our experiment has not demonstrated an increase in the electron temperature, rather our data appear to contradict the direct ionization mechanism in a hollow cathode discharge. More experimental evidence is necessary to determine the relative importance of the two mechanisms and their dependence on experimental conditions. (AIP)

3601 **Direct absorption measurement of the spin-orbit splitting of the ground state in atomic fluorine.** Laguna, G.A.; Beattie, W.H. (Los Alamos National Lab., NM). *Chemical Physics Letters;* **88**: No. 4, 439-440(14 May 1982).

Three hyperfine components of the spin-orbit split ($^2$P/sub 3/2/ → $^2$P/sub 1/2/) ground state in atomic fluorine have been measured by diode laser absorption spectroscopy. The measurement improves the accuracy of the two lines previously reported (404.175 and 403.969 cm$^{-1}$), with the third line at 404.210 cm$^{-1}$. This confirms the spacing of the hyperfine components measured by EPR, and establishes diode laser absorption as a viable technique for determining F-atom concentrations. 1 figure.

3602 **Level crossing studies on ion-collisionally excited He atoms in electric and magnetic fields.** Perschmann, W.D. Berlin, Germany F.R.; Techniche Universitaet (1982). 216p. (In German). Available from the library of Technische Univ. Berlin (Germany, F.R.).

The studies on ion-collisionally excited He atoms with the ion collision apparatus constructed in the framework of this thesis extended to the measurement of the tensor polarizabilities of 1snd$^1$D-terms with n=3,4,5 and 1snd$^3$D-terms with n= 3,4,5,6,7, the fine structure intervals ($n^3D_1$-$n^3D_2$) and ($n^3D_2$-$n^3D_3$) with n=3,4,5,6,7, and to the determination of the excitation matrix of the 1s4d$^1$D-term after collisional excitation by He$^+$ ions in the collision energy range from 10 keV to 40 keV. The determination of the tensor polarizabilities of the 1snd$^1$D terms was performed by the measurement of the magnetic field positions and position shifts of the ΔMsub(L)=2 level crossings produced in parallel electric and magnetic field. Furthermore after 35 keV He$^3$ collisional excitation besides the fine structure internals ($n^3D_1$-$n^3D_2$) which are determined by the measurement of the magnetic field positions of the fine structure level crossings registrated at higher magnetic field strengths also the fine structure intervals ($n^3D_2$-$n^3D_3$) are measured since by the electric field Esub(z) a separation of previously superposed fine structure level crossing signals is caused.

## 6404 Fluid Physics

3603 **(ANL—83-87) Fully coupled calculation of fluid flows with limited use of computer storage.** Vanka, S.P. (Argonne National Lab., IL (USA)). Oct 1983. Contract W-31-109-ENG-38. 30p. NTIS, PC A03/MF A01. Order Number DE84002218.

The report describes and demonstrates the performance of a modification to an earlier solution algorithm for the calculation of multidimensional fluid flow, heat transfer, and combustion processes. The modification significantly reduces the computer storage required by the earlier algorithm without degrading the rate of convergence. The modification called as telescoping subdomain analysis (TSDA) splits the flow domain into overlapping subregions and solves them in a sequence, with known conditions on the boundaries of the subregions. The procedure has been tested in four different two-dimensional recirculating flows and the convergence rates have been equivalent to the rates with full-domain analysis. The modification offers significant savings of computer storage and cost and permits calculations with larger finite-difference grids.

3604 **Enskog theory for multicomponent mixtures. II. Mutual diffusion.** Kincaid, J.M.; Lopez de Haro, M.; Cohen, E.G.D. (Thermophysics Division, National Bureau of Standards, Washington, DC 20234). *Journal of Chemical Physics;* **79**: No. 9, 4509-4521(1 Nov 1983).

We present a detailed description of the mutual diffusion coefficients of binary and ternary dense fluid mixtures of hard spheres, as given by the revised Enskog theory (RET) of van Beijeren and Ernst and the standard Enskog theory (SET) of Tham and Gubbins. The formulas for the diffusion coefficients [see part I of this series, J. Chem. Phys. 78, 2746 (1983)] involve the contact values of the equilibrium pair distribution functions and the chemical potentials, for which the Carnahan—Starling approximation is used. The formulas, which were obtained by making an expansion in Sonine polynomials, are evaluated up to the third order and the convergence of the Sonine polynomial expansion is discussed. Except at low densities, the SET cannot be used to describe diffusion in hard-sphere mixtures. We find, using the CS approximation, that the SET gives values for the direct mutual diffusion coefficients that become negative at very high densities. A study is made of the dependence of the RET mutual diffusion coefficients on a variety of the parameters that determine the mixture (density, composition, molecular masses, and diameters) and a summary of the trends found is given. In particular, the influence of the addition of a third component on the mutual diffusion of two other components is discussed.

3605 **Liquid structure under shear: Comparison between computer simulations and colloidal suspensions.** Hanley, H.J.M.; Rainwater, J.C.; Clark, N.A.; Ackerson, B.J. (Chemical Engineering Science Division, National Engineering Laboratory, National Bureau of Standards, Boulder, Colorado 80303). *Journal of Chemical Physics;* **79**: No. 9, 4448-4458(1 Nov 1983).

Simulated scattered light intensity plots are calculated for a soft sphere inverse-12 system subjected to a shear and are compared to experimental plots for a colloidal suspension under approximately equivalent conditions. The simulated plots were obtained by a Fourier transform of the radial distribution function. The two sets show points of striking similarity: The Debye—Scherrer rings become elliptical when both systems are subjected to the shear, and the light intensity around the rings is a function of polar angle. An interesting feature is the degree to which the experimental plots display non-Newtonian characteristics of the suspension. Overall, the work is a direct comparison of the results of a computer simulation with real experimental data. Suggestions for future work are given.

3606 **Compressibility effect on instability growth rates.** Newcomb, W.A. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550 and Department of Applied Science, University of California, Davis, California 95616). *Physics of Fluids;* **26**: No. 11, 3246-3246(Nov 1983). Contract W-7405-ENG-48.

For an arbitrary magnetostatic equilibrium, instability growth rates are shown to be an increasing function of compressibility.

3607 **Effective mass and the specific heat of normal liquid $^3$He.** Mishra, V.K.; Brown, G.E.; Pethick, C.J. (Department of Physics, State University of New York at Stony Brook, Stony Brook, New York). *Journal of Low Temperature Physics;* **52**: No. 5, 379-408(1 Sep 1983). Contract AC02-76ER13001.

The behavior of the specific heat of liquid $^3$He as a function of temperature implies a rapid variation of effective mass with energy. Recently a model has been developed for understanding this. In this paper we extend this model to explain the low-temperature (T< or =100 mK) specific heat measurements of normal liquid $^3$He by Greywall. We find that the model gives a reasonably accurate description of the data in this temperature range.

**3608 Thermal expansion, velocity of sound, and compressibility in liquid $^3$He under pressure.** Roach, P.R.; Eckstein, Y.; Meisel, M.W.; Aniola-Jedrzejek, L. (Solid State Science Division, Argonne National Laboratory, Argonne, Illinois). *Journal of Low Temperature Physics;* **52**: No. 5, 433-448(1 Sep 1983).

We have measured the pressure at constant volume P/sub v/ (T), of liquid $^3$He as a function of temperature from 10 to 600 mK and at starting pressures from 1.6 to 28.1 bar. Simultaneously, we determined the hydrodynamic sound velocity $c_1$, at the same pressures and temperatures. From these data we have derived very accurate values of the isobaric expansion coefficient α/sub p/ and the adiabatic compressibility k.

**3609 Mass spectra and ionization temperatures in an argon-nitrogen inductively coupled plasma.** Houk, R.S.; Montaser, A.; Fassel, V.A. (Ames Laboratory-U. S. Department of Energy and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *Applied Spectroscopy;* **37**: No. 5, 425-428(Sep 1983). Contract W-7405-ENG-82.

Positive ions were extracted from the axial channel of an inductively coupled plasma (ICP) in which the outer gas flow was Ar, $N_2$, or a mixture of Ar and $N_2$. Addition of $N_2$ to the outer gas decreases the electron number density (n/sub e/) in the axial channel. $Ar^{+2}$, $O_2^+$, and $ArH^+$ react with N-containing species in the plasma and/or during the ion extraction process. $Ar^+$ remains abundant even if there is no Ar in the outer gas, which indicates the probable occurrence of charge transfer reactions between $N_2^+$ and Ar. The present work corroborates two general concepts upon which several theories of theorigin of suprathermal ionization in ICPs are based: (a) species are physically transported from the induction region to the axial channel; and (b) these species may react with a ionize neutral species in the axial channel. Ionization temperatures (T/sub ion/) measured from the ratio $Cd^+/I^+$ were 5750 to 6700 K for a $N_2$ outer flow ICP a forward power of 1.2 kW. This T/sub ion/ range is significantly below that obtained for an Ar outer gas ICP under otherwise similar operating parameters.

**3610 Time evolution of density perturbations in accelerating stratified fluids.** Mikaelian, K.O. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1637-1646(Sep 1983). Contract W-7405-ENG-48.

We consider N superimposed fluids, having arbitrary initial perturbations at their N-1 interfaces, undergoing a Rayleigh-Taylor instability with constant acceleration. The time evolution of these perturbations is described by a sum over normal modes and in general is a combination of oscillation and exponential rise. We derive the equation governing their growth, discuss the case N = 3 analytically, and give two numerical examples where we plot the time evolution of the perturbations at the four interfaces of five superimposed fluids. Our examples illustrate how the evolution depends on the density profile, on the wavelength of the perturbations, and on the initial conditions.

**3611 New representation of Navier-Stokes equations governing self-similar homogeneous turbulence.** Foias, C.; Manley, O.P.; Temam, R. (Indiana University, Bloomington, Indiana 47405). *Physical Review Letters;* **51**: No. 8, 617-620(22 Aug 1983). Contract AC02-82ER12049.

A new form of the Navier-Stokes equation resulting from a change of variables is presented. The new form has several advantages: It yields a new asymptotic behavior of the flow for long times and vanishingly small viscosity. In addition an interpretation of the new equation in terms of a simple random walk yields immediately not only the Kolmogorov (2/3)-power law but also an intermittency exponent well within the experimental uncertainty.

**3612 Quantum nucleation of solids.** Uwaha, M. (Department of Physics and Materials Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois). *Journal of Low Temperature Physics;* **52**: No. 1, 15-40(1 Jul 1983). Contract AC02-76ER01198.

Quantum nucleation of solid $^4$He from superfluid $^4$He is discussed on the basis of a simple isotropic model. The nucleation rate is evaluated in the semiclassical WKB approximation developed earlier by Lifshitz and Kagan. The rate very strongly depends on the magnitude of overpressurization. The effect of a substrate that is characterized by a surface tension is examined; since the substrate reduces the liquid kinetic energy, the nucleation rate is substantially increased when the contact angle is small. The same method is applied to the two-dimensional nucleation of a new atomic layer on a singular face, with the result that the rate is very small under usual conditions.

**3613 Rayleigh—Taylor instability and the use of conformal maps for ideal fluid flow.** Menikoff, R.; Zemach, C. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Computational Physics;* **51**: No. 1, 28-64(Jul 1983).

Potential theory permits ideal fluid dynamics to be formulated in terms of boundary motion. In two dimension, the flow can then be found using conformal mapping. The evolution of some Rayleigh—Taylor instabilities is calculated well into the large amplitude nonlinear regime. The Rayleigh—Taylor calculation for Atwood ratio unity is used as a prototype for a system of theoretical and numerical techniques exploting complex variable theory and high-order quadrature methods.

**3614 Transient behavior of rotating superfluid helium.** Campbell, L.J.; Krasnov, Y.K. (Los Alamos National Laboratory, Los Alamos, New Mexico). *Journal of Low Temperature Physics;* **49**: No. 3, 377-396(1 Nov 1982).

A hydrodynamic analysis of rotation experiments with superfluid helium shows that strong vortex interaction with the boundary must be included for the correct prediction of observed transients during spinup. It also appears that vorticity is created at a smooth boundary at the rate necessary to replenish the vorticity advected away, but is created at a greater rate if the boundary is rough. History-dependent effects are explained on the basis of a remnant vortex density. New experiments are proposed to measure the vortex—boundary interaction.

## 6450 High Energy Physics

**3615 High-energy physics.** Creutz, M. (Brookhaven National Laboratory, Upton, New York). *Physics Today;* **36**: No. 5, 35-43(May 1983). Contract AC02-76CH00016.

Experimentalists in particle physics have long regarded computers as essential components of their apparatus and now theorists are finding that significant advances in some areas can only be accomplished in partnership with a machine.

## 6451 Particle Interactions And Properties - Experimental

*REFER ALSO TO CITATION(S) 3121, 3145, 3166, 3533, 3534, 3813, 3858, 3861, 3906*

**3616 (BNL—33677) Quark search at the CBA.** Larsen, R.C.; Leipuner, L.B.; Morse, W.M.; Adair, R.K.; Kasha, H.; Schmidt, M.P. (Brookhaven National Lab., Upton, NY (USA)). 13 Mar 1983. Contract AC02-76CH00016. 10p. NTIS, PC A02/MF A01. Order Number DE84001459.

An experiment to search for quarks at the CBA is described. The cross sections for the production of massive quark-antiquark pairs in nucleon-nucleon interactions is estimated, and the experimental design and procedures are described. (WHK)

**3617 (CERN—83-02-Vol.2, pp 433-442) Hadron physics at the SPS: Theoretical remarks.** Petronzio, R. (European Organization for Nuclear Research, Geneva (Switzerland)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

A few simple remarks are given about the relevance of the present experimental programme of hadron physics at the fixed-target SPS for quantitative tests of quantum chromodynamics.

3618 (CERN—83-02-Vol.2, pp 1-12) **Nucleon structure functions.** Eisele, F. (Dortmund Univ. (Germany, F.R.)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

In this talk I summarize ideas and plans which have been put forward by members of all collaborations running muon or neutrino experiments at CERN. During our discussions there was general agreement that: i) substantial improvements of structure function measurements in the SPS range are still possible and necessary and ii) it is the responsibility of the present groups and of CERN to provide a "final" set of structure functions in the present energy range.

3619 (CERN—83-02-Vol.2, pp 128-145) **Neutrino oscillations at CERN.** Vannucci, F. (Paris-6 Univ., 75 (France). Lab. de Physique Nucleaire et de Hautes Energies). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

The author reviews the experimental search for neutrino oscillations at CERN.

3620 (CERN—83-02-Vol.2, pp 190-221) **Charm physics at the SPS; Now until approximately 1990.** Geist, W.; Reucroft, S. (European Organization for Nuclear Research, Geneva (Switzerland)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

A review is given of the existing charm programme at the SPS and some future options are discussed. The SPS programme is put into the context of the existing knowledge on charm properties and the associated mysteries.

3621 (CERN—83-02-Vol.2, pp 222-249) **Search for beauty particles at the CERN SPS.** Sacton, J. (Interuniversity Inst. for High Energies, Brussels (Belgium)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

The present status of our experimental knowledge on B-hadron decay and production processes is briefly reviewed. Some ideas are presented on how the future research programme on B-particles could evolve at the CERN SPS.

3622 (CERN—83-02-Vol.2, pp 250-269) **Search for massive neutrinos, axions and SUSY particles at CERN SPS energies.** Barbiellini, G. (European Organization for Nuclear Research, Geneva (Switzerland)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

The author reviews the experimental search for massive neutrinos, supersymmetric particles, and axions at the CERN SPS.

3623 (CERN—83-02-Vol.2, pp 280-314) **Hard scattering and jet physics in connection with real photons.** Pretzl, K.P. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen (Germany, F.R.)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

This report contains a summary of the physics discussed in the working groups on (a) jet physics at the SPS in hadron-hadron collisions, (b) hard scattering with incident real photons and (c) large psub(T) prompt photons in hadron-hadron collisions.

3624 (CERN—83-02-Vol.2, pp 462-476) **Experiments with nuclear beams and targets.** Albrow, M.G. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

After a general introduction to the fundamental interest of studying high energy nucleus-nucleus collisions, some specific signatures of quark-gluon plasma formation are considered from an experimental viewpoint. We then discuss the use of existing and new detectors for an experimental programme at the SPS.

3625 **(DESY—83-034) Inclusive production of electrons and muons in multihadronic events at PETRA.** D'Agostini, G.; Apel, W.D.; Engler, J.; Fluegge, G.; Fries, D.C.; Fues, W.; Gamerdinger, K.; Hopp, G.; Kuester, H.; Mueller, H. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). May 1983. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751350.

The production of prompt leptons at PETRA has been measured for c.m. energies of 14, 22 and 34 GeV. The rate of prompt electrons and muons is presented, including a determination of the semileptonic branching ratio of the c and b quarks. Systematic effects due to changes in fragmentation and other model parameters have been studied.

3626 **(DESY—83-037) Gluon fragmentation in T(1S) decays.** Bienlein, J.K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). May 1983. 11p. (CONF-830140—8). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751352.

From 18. Rencontre de Moriond conference; La Plagne, France (23 Jan 1983).

In Y(1S) decays most observables (sphericity, charged multiplicity, photonic energy fraction, inclusive spectra) can be understood assuming that gluons fragment like quarks. New results from LENA use the (axis-independent) Fox-Wolfram moments for the photonic energy deposition. Continuum reactions show 'standard' Field-Feynman fragmentation. Y(1S) decays show a significant difference in the photonic energy topology. It is more isotropic than with the Field-Feynman fragmentation scheme. Gluon fragmentation into isoscalar mesons (a la Peterson and Walsh) is excluded. But if one forces the leading particle to be isoscalar, one gets good agreement with the data.

3627 **(DESY—83-039) Recent results from Jade on electroweak interactions.** Naroska, B. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jun 1983. 17p. (CONF-830231—6). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751353.

From Europhysics study conference on electroweak effects at high energies; Erice, Italy (1 Feb 1983).

The Jade collaboration has performed measurements at Petra at an average center-of-mass (cms) energy of W approx.= 35 GeV in order to test Quantum Electrodynamics (QED) and electroweak theories. QED tests are still possible because the influence of the neutral weak current is negligible in many places, e.g. in $e^+e^- \rightarrow \gamma\gamma$, or in the total cross sections for $e^+e^- \rightarrow e^+$esup(,) $\gamma\gamma$, $\mu^+\mu^-$, and tau$^+$tau$^-$. On the other hand the interference of the electromagnetic and the weak amplitudes leads to an asymmetry in the angular distributions of $\mu^+\mu^-$ and tau$^+$tau$^-$, which was established for the first time at Petra. The measurements can be compared to predictions of electroweak theories, in particular the 'standard model' of Glashow, Salam, and Weinberg, which has successfully described neutral current phenomena in neutrino scattering and polarized e-d scattering. The tests at Petra were performed at a $Q^2$ much higher than previously available.

3628 **(IFUSP-P—310) Large missing-mass clusters in hydrodynamical approach.** Hama, Y.; Pottag, F.W. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1981. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704280.

The previously proposed hydrodynamical description of the large missing-mass systems in hadron-hadron collisions is applied to analysing recent large-mass data obtained at ISR. The results are still consistent with the data, indicating the usefulness of the large-cluster concept.

**3629 (IFVE-OEIPK—82-153) Energy and quantum number fluxes in $K^+p$ and $\pi^+p$ interactions at 32 and 70 GeV/c.** Azhinenko, I.V.; Belokopytov, Yu.A.; Vorob'ev, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 21p. (In Russian). (SERP-E—78/E-043). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700054.

Energy dE/dlambda, charge dQ/dlambda and strangeness dS/dlambda fluxes in $K^+p$ interactions at 32 and 70 GeV/c, and $\pi^+p$ interactions at 32 GeV/c are studied in terms of the angular variable lambda=x/psub(T) (psub(T) is the transverse momentum, x is the Feynman variable). The data on dQ/dlambda and dE/dlambda are practically energy independent between 32 and 70 GeV/c and do not depend on incident particle. For inclusive non-diffractive, inclusive diffractive and exclusive non-diffractive jets, the fraction of charge in any angular region $\Delta\Omega$ away from the central region is found to be proportional to the energy flux in the same interval. The data on dQ/dE versus lambda are compatible with some versions of dual models and agree also with the Lund Monte-Carlo model. In exclusive channels the average ratio dQ/dS is different from unity and amounts to dQ/dS = 0.78+-0.04, thus showing different probability for the kaon valence anti s and u quark fragmentations. The dQ/dlambda and dE/dlambda distributions in nondiffractive $K^+p$ reactions and $\nu$(anti $\nu$)p interactions are found to be very similar.

**3630** (INIS-mf—8474, pp 39-51) **Neutron-antineutron oscillations from an experimental point of view.** Baldo-Ceolin, M. (Padua Univ. (Italy). Ist. di Fisica; Istituto Nazionale di Fisica Nucleare, Padua (Italy)). 1982. NTIS (US Sales Only), PC A09/MF A01. (CONF-820675—Vol.3).

From International conference on neutrino physics; Balaton, Hungary (14 Jun 1982).

The grand unified gauge theories of elementary particle interactions predict the nonconservation of baryon number. This leads to the possibility of neutron-antineutron mixing and oscillation. Recent experiments for detecting these oscillations, their basic concepts and preliminary results, new limits on oscillation parameters are described. Two main methods: static experiments, using neutrons bounded in nuclei analysed by measuring the nuclear effects of neutron-antineutron oscillation; and dynamic ones using neutrons of artificial sources analysed by modifying external magnetic field are discussed. (D.Gy.).

**3631** (INIS-SU—180, pp 140-153) **Search for neutrino oscillations: present experimental data and future experiments.** Klajn, D.R. (Wisconsin Univ., Madison (USA)). 1981. NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The analysis of neutrino oscillations for the three neutrino system and present experimental data are reviewed. The solar neutrino experiment, reactor experiments, and deep mine experimental data provide evidence for oscillations. Three broad classes of solutions are found. Using these clues definite experiments to discover neutrino oscillations and to measure the parameters of the lepton mixing are discussed.

**3632 (IPNO-TH—82-46) New ISR and collider anti p-p and p-p data and asymptotic theorems.** Nicolescu, B. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Oct 1982. 14p. (CONF-8208103—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704281.

From 4. European symposium on anti NN and anti QQ interactions; Santiago de Compostella, Spain (30 Aug 1982).

We present a general discussion of the rigorous finite-energy effects of asymptotic theorems, with a special emphasis on the confrontation with the new ISR and collider antipp and pp total cross-section data. We point out the possible existence of a minimum in the difference between the antipp and pp total cross-sections.

**3633 (ITEF—103(1982)) Search for events having six quarks in the final state.** Aleshin, Yu.D.; Kiselevich, I.L.; Mel'nichenko, I.A.; Mikhajlichenko, V.I.; Nikitin, S.Ya.; Shkarlet, V.D.; Shidlovskij, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700055.

Search for events related to $pp \rightarrow \Lambda\Lambda K^+K^+$ reaction is carried out by means of a liquid-hydrogen chamber, irradiated by 7.8 GeV/c proton "pencil" beam. Events, related to the above reaction, have not been detected in the experiment. The obtained upper boundary of cross section is 460 nb.

**3634 (JINR—D-1-82-895) Charmed baryon Asub(c)sup(+) production by approximately 58 GeV neutrons on carbon.** Aleev, A.N.; Arefiev, V.A.; Balandin, V.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700056.

The production of the charmed baryon Asub(c)sup(+) by approximately 58 GeV neutrons on carbon is observed. The decay modes detected are: Asub(c)sup(+) → anti $K^0p\pi^+\pi^-$ and Asub(c)sup++) → $\Lambda^0\pi^+\pi^+\pi^-$. The product of the model-dependent partial cross section and its decay probabilities are 31+-4 $\mu$b and 6.9+-1.3 $\mu$b per carbon nucleus, respectively. A lower limit for the inclusive cross section of Asub(c)sup(+) production (taking into account all models considered) at $x > 0$ is found to be about 100 $\mu$b per carbon nucleus at a 90% confidence level. The systematic errors are approximately 45%.

**3635 (JINR—E-1-82-847) Electroweak asymmetry in deep inelastic muon-nucleon scattering.** Argento, A.; Benvenuti, A.C.; Bollini, D. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1982. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700057.

A deep inelastic $\mu$N scattering cross section asymmetry at momentum transfers $Q^2$ ranging from 15 to 180 $GeV^2$ have been measured. The results is in quantitative agreement with the WS/GIM standart electroweak model and allows one to determine the muon neutral current couplings. The interference between the weak and electromagnetic currents has been observed for the first time in the muon-quark interaction. The quantitative interpretation of the results relies on the validity of the quark parton model and the radiative corrections. The mixing angle of the standard WS/GIM model is sinsup(2)thetasub(W)=0.23+-0.07 (stat.) +- 0.04 (syst.).

**3636 (JINR—R-1-82-334) Study on the dimensions of the radiation region of secondary negative pions produced in $\pi$pN and $\pi^-$C interactions at 40 GeV/c in different reference frames.** Angelov, N.; Akhababyan, N.; Grishin, V.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700058.

Dimensions of the emission region in $\pi^-$p, $\pi^-$n and $\pi^-$C interactions at 40 GeV/c are determined by the method of interference of identical secondary particles. It is found that for pion-nucleon collisions a minimum of this region manifests itself in the "quark" reference frame, which is indicative of a dominant role of one-quark interactions in multiparticle processes. In pion-nucleus collisions a minimum of the emission region of secondary pions is shifted to the $\pi^-$N c. m. s. It is interpreted as a multiquark interaction contribution increase in this processes.

**3637 (JINR—R-1-82-559) Change of space-time characteristics of radiation region of secondary $\pi$p-mesons produced in pion-nucleon interactions at 40 GeV/c on reference frame.** Angelov, N.S.; Akhababyan, N.O.; Grishin, V.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700059.

From an analysis of the experimental data on multiparticle production in pion-nucleon interactions at 40 GeV/c a dependence of the space-time lsub(i) parameter dimensions of the secondary $\pi^-$-esmission region of the Lorentz-factor $\gamma$ of a given reference frame

is established. The obtained dependences lsub(i)=f(γ) of the parameters lsub(i) show up extrema, shifted from the "π-N" c. m. s. towards the c. m. s. of the colliding quarks. This fact may be interpreted as a manifestation of the quark structure of the primary hadrons in multiple processes.

3638 **(JINR—R-1-82-887) Differential cross section of eta meson production on carbon by πp mesons at the momentum of 3.3 GeV/c.** Arkhipov, V.V.; Astvatsaturov, R.G.; Knapik, E.; Malakhov, A.I.; Melkumov, G.L.; Plyashkevich, S.N.; Khachaturyan, M.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700060.

$\pi^-$ Asub(Z) → etaAsub(Z-1) differential cross section has been measured on carbon nuclei at 3.3 GeV/c pion momentum in range of squared momentum transfer -t from tsub(min) to -0.4 $(GeV/c)^2$. The results are compared with the previous ones, obtained during the measurements of the reaction $\pi^- p \rightarrow$ etan with liquid-hydrogen target. In the differential cross section for the reaction on carbon a minimum in the forward direction, much deeper than for hydrogen was observed. In the framework of incoherent particle production theory the measured effective number of protons in carbon nuclei is Zsub(eff)sup(C)=3.2+-0.7. The experimentally determined Zsub(eff)sup(C)(t) dependence for 0<-t<0.4 $(GeV/c)^2$ is presented.

3639 **(JINR—R-4-82-633) μ-capture in a liquid hydrogen.** Bakalov, D.D.; Vinitskij, S.I.; Ponomarev, L.I.; Men'shikov, L.I.; Fajfman, M.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703990.

The capture of $\mu^-$-meson $\mu^- + p \rightarrow n + \nu_\mu$ in liquid hydrogen is considered allowing for the kinetics of ion-molecular and mesic molecular reactions. The conversion ortho-. para Ei-transition due to the particle spin interaction is shown to occur in the mesic molecule ppμ with the rate lambdasub(op)=(7.1 +- 1.2) x $10^4$ $s^{-1}$. The calculated μ-capture rate in liquid hydrogen equals Asub(c) = (494 +- 16) $s^{-1}$.

3640 **(LA—9798-P) Physics with LAMPF II.** (Los Alamos National Lab., NM (USA)). Jun 1983. Contract W-7405-ENG-36. 436p. NTIS, PC A19/MF A01. Order Number DE83016338.

This report gives the scientific justification for LAMPF II, an upgrade of the 800-MeV LAMPF accelerator to a 16- or 32-GeV higher primary and secondary beam intensities available in this energy region, qualitatively new experiments will become possible in four main areas of physics: (1) nuclear physics, using both conventional strange-particle or antinucleon probes; (2) the strong interactions of few-hadron systems; (3) electroweak interactions, testing the Standard Model and its possible extensions with high-precision experiments and searches for rare decays; and (4) interdisciplinary studies, such as the investigation of solid-state properties using muons. The background and present status in each area are presented and compared with what can be done with LAMPF II. Each exposition is followed by preliminary proposals for particular experiments to be performed, exploiting LAMPF II's unique capabilities. Appendices describe design features of the LAMPF II accelerator and experimental areas as well as possible further expansions of LAMPF II into new areas of physics. Separate entries were made in the data base for the papers presented. (WHK)

3641 (LA—9798-P, pp 46-50) **Radiative kaon capture.** Hynes, M.V. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Unlike radiative pion capture, radiative kaon capture is an almost unexplored field. The importance of this work arises from its potential contribution to our understanding of low-energy K-n and Λ-N scattering parameters. A measurement of the reactions K anti p → Λ γ and Σγ is proposed. A novel technique of final-state identification is employed that in principle allows for the detection of the Dalitz pair process as well. The importance of beams with high purity and flux is discussed along with count-rate estimates.

3642 (LA—9798-P, pp 54-59) **Hypernuclei.** Gibson, B.F. (Los Alamos National Lab., NM); Stein, N.; Dover, C.B. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The uses of kaon beams for producing hyperons and hypernuclei and the uses of hyperons as probes of nuclear structure are discussed. (WHK)

3643 (LA—9798-P, pp 60-65) **Search for a possible strangeness S = -2 dibaryon.** Barnes, P.D. (Carnegie-Mellon Univ., Pittsburgh, PA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We discuss a proposed search for a bound six-quark state. The methods are ideally suited for LAMPF II in view of the high-flux $K^-$ beams expected. The event rates discussed are marginal with a $K^-$ flux of 4 x $10^5$/s but would become quite practical at LAMPF II with $K^-$ fluxes of ~ $10^7$/s near 1.8 GeV/c.

3644 (LA—9798-P, pp 66-68) **Search for strange dibaryons at KEK and LAMPF II.** Masaike, a. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A possible experiment to search for strange dibaryon H is described. It is pointed out that, at present, the KEK-K2 beam line is the best facility in the world for such an experimental effort. However if the cross section for the production of these dibaryons were less than 10 nb, higher $K^-$ beam intensities, such as those likely to become available at LAMPF II, will be needed.

3645 (LA—9798-P, pp 69-73) **Weak decay of lambda hypernuclei.** Barnes, P.D.; Grace, R. (Carnegie-Mellon Univ., Pittsburgh, PA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Investigations of the weak decay mechanisms of lambda hypernuclei have been discussed in the literature for a few light nuclei. These studies are generally very limited in scope and suffer from poor statistics. Preparations are currently in progress to study all the major weak decay modes of $^{12}C$ at the AGS but these too are severely hampered by the low kaon flux available. It is clear that the opportunity to learn about the four fermion weak interaction with strangeness-changing currents will not be fully exploited until the high-flux K beams at a facility like LAMPF II become available. We discuss the physics motivation and experimental requirements of the AGS measurements as an example of what can be done now for $^{12}C$. A much lighter and heavier hypernucleus would also be of great interest but current fluxes make this very difficult to pursue.

3646 (LA—9798-P, pp 74) **Experiments with Λ hypernuclei.** Chrien, R.E. (Brookhaven National Lab., Upton, NY). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment to measure precisely the p/sub 3/2/ - p/sub 1/2/ Λ-nucleus energy difference in $^{13}C$ is described. Increased flux and better quality of the kaon beams at LAMPF II are expected to make such precise measurements possible.

3647 (LA—9798-P, pp 75-77) **Measurement of $^{13}C$ magnetic moment.** Funsten, H.O. (Coll. of William and Mary, Williamsburgh, VA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

It is proposed to use the polarizing ($K^-$, $\pi^-$) reaction to yield $^{13}C$ polarized perpendicular to the scattering plane. Precession of $^{13}C$ in a 100-kG superconducting solenoid will be determined by a scintillator array that detects the weak decay $\pi^-$. From this the magnetic moment of $^{13}C$ will be determined.

3648 (LA—9798-P, pp 78-82) **Possible investigations of the ($K^-$, $K^+$) reaction.** Hungerford, E.V. (Univ. of Houston, TX). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Production of S = -2 hypernuclei through a one-step process such as ($K^-$, $K^+$) is examined. The proposed LAMPF II facility

would provide the higher $K^-$ beam intensities required for the studies of such low cross-section reactions.

3649 (LA—9798-P, pp 83-84) **Studies of narrow Σ-hypernuclear structure.** Hungerford, E.V. (Univ. of Houston, TX). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A high flux $K^-$ beam of good purity will facilitate narrow Σ-hypernuclear structure studies through the $(K^-,\pi^-)$ reaction.

3650 (LA—9798-P, pp 85-88) **How to populate bound hypernuclear levels.** Majling, L. (Nuclear Physics Inst. Academy of Science, Prague, Czechoslovakia); Zofka, J.; Fetisov, V.N.; Eramzhyan, R.A. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Based on nucleon decays of hypernuclear resonances from (K⁻,π/sup anti 0/) reactions, an alternative for populating the lower part of hypernuclear spectra is suggested. The emitted nucleons reveal structure of the resonances. The subsequent production of various hypernuclear γ-quanta and their applicability is discussed.

3651 (LA—9798-P, pp 89-91) **Hadronic atoms: the hadron-nucleus strong interaction.** Leon, M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Hadronic atoms can give valuable information on negative hadron-nucleus strong interaction. We discuss some of the developments in this area that can be expected at LAMPF II.

3652 (LA—9798-P, pp 92-93) **$K^-$ and $\Sigma^-$ atoms and $p(K^-,\gamma)$.** Roberts, B.L. (Boston Univ., MA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We discuss $K^-$ and $\Sigma^-$ hadronic x-ray experiments and radiative kaon capture at a kaon factory.

3653 (LA—9798-P, pp 94-95) **Sigma-minus hydrogenic atoms.** Welsh, R.E. (Coll. of William and Mary, Williamsburg, Va); Kunselman, R. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The use of tagged $\Sigma^-$'s for $\Sigma^-$-hydrogen x-ray experiments is discussed.

3654 (LA—9798-P, pp 96-98) **High-precision studies of exotic x rays from hadronic atoms with crystal diffraction spectrometers.** Lu, D.C. (Yale Univ., New Haven, CT). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The possibilities for high-precision studies of $\pi^-$, $K^-$, anti p, $\Sigma^-$, $\Xi^-$, and $\Omega^-$ x rays using crystal diffraction spectrometers and a target adjacent to the LAMPF II beam dump, are discussed.

3655 (LA—9798-P, pp 99-100) **Studies of the E2 nuclear resonance effect in kaonic atoms.** Reidy, J.J. (Univ. of Mississippi, University). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Kaonic x-ray experiments involving the E2 nuclear resonance effect, and their significance, are discussed.

3656 (LA—9798-P, pp 101-103) **Measurement of two-nucleon absorption rates in $K^-$ absorption at rest.** Seki, R. (California State Univ., Northridge). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Measurements of products that result from absorption of stopped $K^-$ by two nucleons are proposed. From the measurements we expect to obtain information useful for understanding nuclear correlations in the nuclear surface.

3657 (LA—9798-P, pp 139-145) **Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions.** Liu, L.C. (Los Alamos National Lab., NM); Plendl, H.S.; Albright, J.R.; Huettmeier, U.J.; Lieb, B.J. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We propose to measure the lifetimes of the excited states of λ and Σ hyperons inside nuclei by detecting products from the hyperon decay in coincidence either with prompt gammas from the residual nucleus or with the recoil of the residual nucleus. Results of our study will make it possible to test quark wave functions of the excited states of the SU(6) x 0(3) model.

3658 (LA—9798-P, pp 156) **Strong interactions: few hadron systems.** Bonner, B.E.; Gibbs, W.R. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The studies considered in this section are the fundamental ones for the investigation of quark and gluon degrees of freedom. The variety of systems that can be formed copiously is truly impressive. Indeed a very large number of quark combinations are possible.

3659 (LA—9798-P, pp 157-159) **Antinucleon-nucleon physics.** Bonner, B.E. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The expected antiproton flux in a time-separated beam at LAMPF II is shown graphically. Examples of experiments that can be addressed uniquely at LAMPF II are given, and a comparison is made between the event rates expected at LEAR and LAMPF II for the textbook measurement of the electromagnetic form factor of the proton in the time-like region. (WHK)

3660 (LA—9798-P, pp 160-161) **Study of charmonium states.** Bonner, B.E. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A strong case is made that the intense time-separated antiproton beam of LAMPF II would enable measurements of the widths of some of the chi states of charmonium. This would provide stringent constraints on quantum chromodynamics calculations.

3661 (LA—9798-P, pp 162-164) **Tagged antineutron experiments.** Dieterle, B. (Univ. of New Mexico, Albuquerque). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Antineutron beams having $\Delta p/p$ of 1% and a flux of $\geqq 10^4$/s will be available for the first time at LAMPF II. Antineutron-nucleon scattering experiments and new particle searches at the level of 10 μb can be performed using this facility. The tagged beam described here is lower in intensity than what could be produced, but has clean rejection of gammas and neutrons.

3662 (LA—9798-P, pp 165-167) **p anti p → $l^+l^-$: a LAMPF II proposal.** Glass, G. (Texas A & M Univ., College Station). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Lepton pair-production experiments from proton-antiproton annihilation will become feasible at the energy and intensities proposed for LAMPF II. A measurement of the proton form factor in the time-like momentum-transfer region will provide a test of dispersion relations and deepen our understanding of the vector meson's contributions to the proton form factor. Tests of quantum electrodynamics will also benefit from these experiments.

3663 (LA—9798-P, pp 168-172) **Studies of anti NN polarization experiments at LAMPF II.** Simmons, J.E. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Polarization experiments in the anti NN system at the future LAMPF II accelerator have the potential for increasing knowledge of the nuclear force and resonance phenomena at GeV energies. The high anti p beam intensity allows the possibility for generation of usable polarized anti p beams by scattering. A survey of existing anti p p analyzing power experiments is given. Some future experiments with polarized targets, including possible, new spin-correlation experiments employing a polarized anti p beam, are discussed.

3664 (LA—9798-P, pp 173-174) **Search for mesons in the mass range 2.5 to 5 GeV/c².** Wolfe, D. (Univ. of New Mexico, Albuquerque). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An accumulator-storage ring arrangement with very small $\Delta p/p$, similar to the situation at CERN, is suggested and recommended for future anti p physics at LAMPF II.

3665 (LA—9798-P, pp 175-176) **Hyperon-nucleon interactions.** Gibson, B.F. (Los Alamos National Lab., NM); Oostens, J. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

One of the fundamental questions facing physicists today is that of how we unify the basic forces of nature: gravitational, electromagnetic, strong nuclear, and weak nuclear. Some headway toward achieving that goal has been attained, but more data are needed concerning the strong force. To that end one wishes to study the hyperon-nucleon (YN) interaction in the same vein that the nucleon-nucleon (NN) interaction has been explored. In addition, one wishes to investigate the structure of hypernuclei to understand the details of this new form of nuclear matter. To do so, one is driven to study the YN interaction to model even the simplest of hypernuclei, just as one requires reasonable knowledge of the NN force to make significant model statements about conventional nuclei. Experimental data needs on YN scattering are discussed. (WHK)

3666 (LA—9798-P, pp 177-179) **Spectroscopy of strange dibaryons with $K^- d \rightarrow \Lambda p \pi^-$ reaction.** Hungerford, E.V.; Piekarz, H. (Univ. of Houston, TX). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Studies of the lowest strange dibaryons with $K^- d \rightarrow \Lambda\, p\pi^-$ reaction are proposed.

3667 (LA—9798-P, pp 180-185) **ΞN scattering as a probe of the strong interaction.** Hynes, M.V. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The hitherto successful treatment of the nucleon-nucleon force by boson exchange models using a basically Yukawa-like description did not recognize that nucleons are extended structures containing quarks and gluons. The central issue today is what new physical content, if any, do we introduce when quarks are used in nuclear physics. The experiment proposed here uses the strange quark as a tracer that can be followed easily through the dynamics of a hyperon-nucleon scattering process. The $(K^-,K^+)$ reaction on a proton target will be used to produce $\Xi^-$ hyperons. The subsequent interaction of the $\Xi^-$ with the protons in the target will be reconstructed from the decay products. This production mechanism yields $\Xi^-$ hyperons polarized perpendicular to the production plane. The measurement of the spin-averaged and spin-aligned cross sections proposed here will provide an important determination of the success or failure of one-boson or one-quark exchange descriptions. Count rate estimates show that this experiment would require $10^4$ h of $K^-$ beam at currently available fluxes. At LAMPF II fluxes it would require 100 h.

3668 (LA—9798-P, pp 186-190) **Are there bound A = 2 hyperon states.** Bozoian, M.; van Doremalen, J.C.H.; Weber, H.J. (Univ. of Virginia, Charlottesville). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

One-boson-exchange potentials for ΛN, $\Sigma^+p$, ΛΛ, and ΞN elastic scattering at E/sub lab/ ≧ 150 MeV are calculated, including renormalizations from two-boson exchanges. The model is derived from a quark pairing mechanism that has been tested previously for elastic NN scattering. The resulting phase shifts and effective range parameters are compared with data and other phenomenological potentials for ΛN and $\Sigma^+p$ systems, and reasonable agreement is achieved. In the ΛΛ and ΞN channels, deuteron-like bound states may exist.

3669 (LA—9798-P, pp 191-192) **Antihyperon-nucleon scattering.** Riley, P.J. (Univ. of Texas, Austin). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

At LAMPF II we propose elastic and inelastic antihyperon- and hyperon-nucleon scattering measurements, such as $\Lambda^0$N, anti $\Lambda^0$N, ΣN, anti Σn, and anti ΞN. The measurements will use hyperon beams produced by the pair-creation p anti p → YY interaction, where Y = Λ, Σ, Ξ, using the LAMPF II time-separated antiproton beam.

3670 (LA—9798-P, pp 193-195) **Nucleon-nucleon interactions: quark dynamics.** Lomon, E.L. (Massachusetts Inst. of Tech., Cambridge). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Present-day particle theory describes hadrons as systems of quarks bound by gluon exchange and suggess that the resultant degrees of freedom should be important (and may even dominate) at ranges as large as about 1 fm. That quark degrees of freedom have not been dramatically manifest in medium-energy particle and nuclear experiments to date may be tentatively attributed to the relatively low density of nuclei and the fact that until now accelerators could only explore with precision at the threshold of the critical range of momentum transfers and excitation energies. It is also possible that a duality of the hadron and quark descriptions in the vicinity of 1 fm obscures the onset of quark and gluon degrees of freedom. For these reasons one needs to extend the exploration by means of precise measurements at high-momentum transfers to determine where the hadronic description continues to be valid or alternatively where effects of quark degrees of freedom are important. Theoretical and experimental evidence exists to suggest that specific signatures of quark and gluon degrees of freedom may be manifest in experiments using beams of energy beginning at 1 GeV. The predicted multihadron quark bag states have not yet shown up as narrow states, due to their coupling to the continuum; but the zeros these states produce in the wave function near 1 fm have been identified by detailed amplitude analyses of meson-meson, meson-nucleon, and nucleon-nucleon experiments.

3671 (LA—9798-P, pp 196-199) **Nucleon-nucleon scattering above LAMPF energies.** Bhatia, T.S. (Los Alamos National Lab., NM); Yokosawa, A. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Some polarization experiments in nucleon-nucleon scattering above LAMPF energies are discussed. Polarized beams and targets at facilities such as SATURNE, KEK, AGS, and LAMPF II will permit such investigations.

3672 (LA—9798-P, pp 201-202) **Meson-nucleon systems.** Gibbs, W.R. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

One of our most powerful means of probing hadronic structure is through the study of the meson-nucleon system. The position of (indeed even the existence of) pion-nucleon resonances forms the initial basis of the quark model. Future QCD theories of confinement will predict the shapes of functions describing the distributions of quarks within the hadronic system. In present nomenclature, these might be described as the bag size and diffuseness. The strength and range of the interaction of each pion-nucleon partial wave thus gives precise, direct information about these fundamental theories.

3673 (LA—9798-P, pp 203-204) **Baryon spectroscopy.** Cutkosky, R.E. (Carnegie-Mellon Univ., Pittsburgh). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Low-energy hadron spectroscopy is the natural place to study quark and gluon confinement effects and other nonperturbative features of QCD. To test the theory adequately, precision data are called for. It is not enough to just look at the ground states (s-wave quarks or antiquarks). In fact, discrepancies with simple models (such as the bag model) already show up strongly at the quark-P-wave levels ($N^*$ and $\Delta^*$ with 1.5 GeV ≦ M ≦ 1.7 GeV). It has been known for some time that many properties of these states can be understood qualitatively in terms of a model with perturbing forces suggested by QCD (provided one leaves out the spin-orbit forces). More recent work has shown that there are also

definite deviations from the lowest order predictions of QCD and that additional corrections are needed that may be nonperturbative in origin. To understand these quark-P-wave baryons properly, it is desirable also to have good data on the next set of odd-parity states, up to about 2.5 GeV. Requirements for $\pi$-N experiments for baryon spectroscopy studies are discussed. (WHK)

3674 (LA—9798-P, pp 205-207) **Pion-nucleon physics at LAMPF II.** Hoehler, G. (Universitaet Karlsruhe, Germany). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

New experimental data for the reactions $\pi N \rightarrow \pi N$ and $\pi N \rightarrow N\pi\pi$ are mainly important for the study of three problems: (1) nucleon spectroscopy; (2) secondary terms of the asymptotic expansion; and (3) analytic continuation to the unphysical region. These problems are discussed.

3675 (LA—9798-P, pp 208-210) **Spin-rotation parameter in $K^+$-p elastic scattering near 1.5 GeV/c.** Igo, G. (Univ. of California, Los Angeles). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The measurement of the spin-rotation angle $\beta$ is proposed in $K^+$-p and $\pi^+$-p elastic scattering at 1.0-, 1.25-, and 1.5 GeV/c incident momenta.

3676 (LA—9798-P, pp 211-212) **Elastic $K^+N$ scattering.** Bhatia, T.S. (Los Alamos National Lab., NM); Glass, G. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

High-intenstiy $K^+$ beam at LAMPF II with low pion contamination will permit high-precision $K^+N$ studies.

3677 (LA—9798-P, pp 213-218) **Low-energy $K^-p$ interactions.** Miller, D.J. (University Coll., London, England). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The importance of complete high-statistic $K^-p$ experiments, at rest and across the cusp region, is discussed.

3678 (LA—9798-P, pp 219) **Glueballs.** Glass, G. (Texas A & M Univ., College Station). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Gluons, the transmitters for the strong force, have yet to be established as particles that bind together without the presence of quarks. Such bound states or resonances, if they exist, are referred to as glueballs. Experiments are in progress to investigate these resonances and a LAMPF II program would add significantly to these studies.

3679 (LA—9798-P, pp 220-223) **Electroweak interactions.** Goldman, T. (Los Alamos National Lab., NM); Hoffman, C.M.; Mischke, R.E.; Lubatti, H.J. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The most exciting recent development in elementary particle physics has been the successful unification of the electromagnetic and the weak interactions. Presently, all experimental data on electroweak processes are consistent with the Glashow-Weinberg-Salam (GWS) or Standard Model, including the Glashow-Iliopoulos-Maiani (GIM) mechanism to suppress strangeness-changing neutral currents. However, as is discussed, many questions reamin. These questions dictate that we perform detailed tests of the Standard Model and that we search for evidence indicating whether the Standard Model requires modification or extension.

3680 (LA—9798-P, pp 224-226) **Neutrino reactions.** Rosen, S.P.; Carlini, R. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The extremely high neutrino flux at LAMPF II makes possible a set of important experiments that cannot be done at existing facilities. LAMPF II is an ideal facility for investigating the Lorentz structure of the leptonic neutral current, studying neutrino oscillations, observing the weak-charged neutral-current interference, and testing $\mu$-e universality.

3681 (LA—9798-P, pp 227-236) **Neutrino interactions with nuclei.** Walecka, J.D. (Stanford Univ., CA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We examine tests of the Glashow-Weinberg-Salam (GWS) Standard Theory of Electroweak Interactions. The tests are model-independent in the sense that they are relations between experimental quantities that are direct consequences of the GWS theory, but they are independent of the detailed structure of the nucleus. Such relationships were anticipated by Weinberg. Neutrino reactions with nuclei are considered, focusing largely on charged-lepton production, and it is demonstrated that intermediate-energy neutrino reactions have a central and unique role to play in our understanding of semileptonic weak interactions. This point is illustrated by discussing a complete kinematic experiment on the nucleon. A discussion of what neutrino reactions could teach us about nuclear structure is also given. (WHK)

3682 (LA—9798-P, pp 243-244) **Possibility of observing nu p elastic scattering in a hydrogen bubble chamber at LAMPF II.** Hoffman, C.M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The possibility of employing a hydrogen bubble chamber to observe nu p elastic scattering is discussed. In a chamber with a fiducial volume of 2 $m^3$, a cycle rate of one per second, a 60-Hz nu/sub mu/ beam produced by 400 $\mu$A of 4-GeV protons, and a $<E_{nu}> \simeq$ 500 MeV, the nu $\mu$p event rate would be approximately 20 per day. Backgrounds are also discussed.

3683 (LA—9798-P, pp 253-255) **Neutrino-electron elastic scattering.** Carlini, R. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A neutrino-electron elastic-scattering experiment is proposed for LAMPF II. The basic elastic reactions that could be studied are presented, and the implications of such studies are discussed. Two experimental approaches are detailed.

3684 (LA—9798-P, pp 256-260) **Neutrino physics at LAMPF II with a liquid time projection chamber detector.** Allen, R.C.; Chen, H.H.; Doe, P.J.; Hausammann, R.; Mahler, H.J.; Wang, K.C. (Univ. of California, Irvine). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We suggest the use of a liquid time projection chamber to study neutrino-electron and neutrino-proton elastic scattering and neutrino oscillations at LAMPF II. The essential ideas, with an estimate of rates, are discussed.

3685 (LA—9798-P, pp 274-276) **Experiment to measure the decay K/sub $L/^0 \rightarrow \pi^0 e^+ e^-$.** Littenberg, L. (Brookhaven National Lab., Upton, NY). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The design of an experiment to measure the CP-violating decay K/sub $L/^0 \rightarrow \pi^0 e^+ e^-$ at LAMPF II is presented. An experimental sensitivity to a branching ratio as small as $10^{-11}$ appears possible.

3686 (LA—9798-P, pp 277-280) **CP-violating polarization in K/sub $\mu 3/^+$ and K/sub $\mu 3/^0$ decays.** McFarlane, W.K. (Temple Univ., Philadelphia, PA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Polarization of the muon in K/sub $\mu 3/$ decay that is transverse to a suitably defined decay plane would violate time-reversal invariance and hence CP invariance. Existing experiments limit the magnitude of the T-violating polarization to less than about $6 \times 10^{-3}$. The possibility of using LAMPF II to improve this limit is discussed.

3687 (LA—9798-P, pp 281-283) **Consideration of a measurement of $(eta_{00})^2/(eta/sub\ +-/)^2$.** Cronin, J.W. (Univ. of Chicago, IL). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The possibility of measuring $(eta_{00})^2/(eta/sub +-/)^2$ with an accuracy of better than 0.5% at LAMPF II is explored. A possible design of an experiment is presented.

3688 (LA—9798-P, pp 284-285) **Experiment to measure $eta_{000}$.** Hoffman, C.M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment to search for CP-violating $K^0 \rightarrow 3\pi^0$ decays at LAMPF II is discussed. A sensitivity to $(eta_{000})$ as large as $10^{-2}$ appears feasible.

3689 (LA—9798-P, pp 286-287) **Measurement of CP violation in Λ decay.** Kalogeropoulos, T. (Syracuse Univ., NY). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The possibility of searching for CP violation by comparing Λ and anti Λ decays is discussed. With an anti p beam that has been proposed for LAMPF II, differences in decay rates as low as $10^{-4}$ can be explored.

3690 (LA—9798-P, pp 288-289) **CP symmetry in a high magnetic field.** Maki, A. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The experiment described would investigate whether CP in the $K^0$ system persists in a high magnetic field. If CP violation is a manifestation of a broken symmetry in a gauge theory, CP symmetry could be restored above a certain critical magnetic field.

3691 (LA—9798-P, pp 290-301) **Kaon decays.** Goldman, T. (Los Alamos National Lab., NM); Herczeg, P.; Mischke, R.E.; Lubatti, H.J. (comps.). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The decays of the charged and neutral kaons have played an extremely important role in our understanding of the fundamental interactions. The observation of $2\pi$ and $3\pi$ decay modes of the charged kaons led to the discovery of parity nonconservation in the weak interactions. The breakdown of CP symmetry was found in the $2\pi$ decays of the K/sub L/. More recently, the suppression of decays such as K/sub L/ $\rightarrow \mu^+\mu^-$ led to the prediction of the charmed quark. [Subsequently, the order of magnitude of the charmed quark mass was successfully predicted from the observed K/sub L/ - K/sub S/ mass difference (Δm/sub K/).] Studies of the decay modes of the K mesons continue to be of great interest. As we discuss here, their study can provide information of fundamental importance and may even lead to discoveries with far-reaching consequences. We primarily address rare (small branching ratio) kaon decays, the study of which will benefit most from the increase in intensity provided by LAMPF II. These include: (1) lepton-family violating kaon decays (for example, K/sub L/ $\rightarrow \mu e$); (2) lepton-family conserving allowed decays that are severely suppressed in the standard model (for example, K/sub L/ $\rightarrow \mu^+\mu^-$); and (3) allowed but suppressed decays for which the observables measured in the final state do not fully identify the decay mode. These decays may involve new, conjectured particles. (For example, $K^+ \rightarrow \pi^+$nu anti nu appears experimentally as $K^+ \rightarrow \pi^+ +$ nothing seen, where the latter may be objects other than neutrinos. 46 references. (WHK)

3692 (LA—9798-P, pp 302-303) **Experiment to measure the kaon beta decay rate.** Highland, V.L. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

With the intense K/sub L/$^0$ beams available at LAMPF II, a measurement of the rate K/sub L/$^0 \rightarrow K^{+-}e^{-+}$nu is feasible. A possible experiment is described.

3693 (LA—9798-P, pp 304-308) **Search for exotics in two-body decay of $K^+$: K/sub $\mu_2$/ and K/sub $\pi_2$/ revisited.** Yamazaki, T. (Univ. of Tokyo, Japan). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

New light is shed on K/sub $\mu_2$/ and K/sub $\pi_2$/ decays of $K^+$ in view of the possible existence of heavy neutrinos and Higgs particles, which could be revealed in high-resolution spectroscopy in a wide momentum range. A recent experiment at KEK is described and future perspectives are given.

3694 (LA—9798-P, pp 309-311) **Searching for $K^+ \rightarrow \pi^+\mu^+e^-$.** Chaloupka, V.; Lubatti, H.J.; Rothberg, J.E.; Young, K.K. (Univ. of Washington, Seattle). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment to search for $K^+ \rightarrow \pi^+\mu^+e^-$ at LAMPF II is described. It is based on an approved BNL experiment but would be sensitive to the $10^{-12}$ level.

3695 (LA—9798-P, pp 312-315) **Considerations on a detector system for LAMPF II sensitive to K$^0$/sub L/ $\rightarrow \mu e$ at the $10^{-12}$ level.** Chaloupka, V. (Univ. of Washington, Seattle); Lubatti, H.J.; Rothberg, J.E.; Young, K.K.; Hoffman, C.M. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment is described that could search for the lepton-flavor violating decay for K$^0$/sub L/ $\rightarrow \mu e$ with a sensitivity $<10^{-12}$ at LAMPF II. The apparatus could also search for muon polarization in K$^0$/sub L/ $\rightarrow \mu^+\mu^-$ and for the rare decay K$^0$/sub L/ $\rightarrow e^+e^-$.

3696 (LA—9798-P, pp 316-318) **Experiment to study the decay $K^+ \rightarrow \pi^+$ nu anti nu.** Louis, W.C. (Princeton Univ., NJ). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A possible LAMPF II experiment is presented that would measure the decay $K^+ \rightarrow \pi^+$ nu anti nu to the $10^{-12}$ level. In addition the experiment would be sensitive to other rare decay modes such as $K^+ \rightarrow \pi^+X$, $K^+ \rightarrow \pi^+\gamma\gamma$, $K^+ \rightarrow \pi^+\mu^+\mu^-$, $K^+ \rightarrow \pi^+\mu e$, and $K^+ \rightarrow \mu^+$ nu nu anti nu. In the context of the present standard theory with three generations, the branching ratio is estimated to be in the range $10^{-10}$ to $3 \times 10^{-9}$.

3697 (LA—9798-P, pp 319-329) **Hyperon decays.** Goldman, T. (Los Alamos National Lab., NM); Hynes, M.V.; Mischke, R.E.; Oka, T.; Sanford, T.W.L. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Just as LAMPF has permitted new levels of precision in investigations involving pions and muons, LAMPF II will facilitate such progress above the threshold for production of particles with strangeness. While the strange mesons may receive most attention from particle physicists, the strange baryons also provide essential input to the search for a complete description of subatomic physics. To keep the discussion of hyperon decays together, some topics in strong-interaction physics are included in addition to those relevant to electroweak physics. 39 references.

3698 (LA—9798-P, pp 330-332) **Measurement of the decay asymmetry in $\Sigma^+ \rightarrow p\gamma$.** Zeller, M.E. (Yale Univ., New Haven, CT). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

With the anticipated low-momentum $K^-$ fluxes at LAMPF II, one can investigate the spin dependence of the decay $\Sigma^+ \rightarrow p\gamma$.

3699 (LA—9798-P, pp 339-341) **XI$^0$ experiments.** Overseth, O.E. (Univ. of Michigan, Ann Arbor). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Production of hyperon beams by protons is discussed. Hyperon physics is illustrated by a description of possible experiments using XI$^0$ including allowed decays, possibly forbidden processes, and studies of T and CP invariance.

3700 (LA—9798-P, pp 342-344) **Polarizion experiments with hyperons.** Overseth, O.E. (Univ. of Michigan, Ann Arbor). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

LAMPF II can contribute to our understanding of spin dependence at high energies. Parity-violating polarizations, Λ-proton

elastic scattering, and polarized protons and antiprotons from Λ, anti Λ decay are discussed.

3701 (LA—9798-P, pp 345-346) **Exotic atoms and hyperon properties.** Leon, M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Information on hadron masses and electromagnetic moments can be extracted from exotic atom studies. Any anomalous π-μ interaction can be searched for by examining (π/sup +-/μ/sup -+/) atoms from K°/sub L/ decay. Some of the possibilities in these areas at LAMPF II are discussed.

3702 (LA—9798-P, pp 347-349) **Magnetic moment of the negative sigma hyperon: sigma hyperon-nucleus interactions.** Kunselman, R. (Univ. of Wyoming, Laramie); Welsh, R.E. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The technique of tagging $\Sigma^-$ production is presented, and its use for $\Sigma^-$ x-ray studies is described.

3703 (LA—9798-P, pp 350-351) **Omega-minus atoms.** Kunselman, R. (Univ. of Wyoming, Laramie). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The prospects for measuring the Omega$^-$ magnetic and electric quadrupole moments in Omega$^-$-atom experiments at LAMPF II are discussed.

3704 (LA—9798-P, pp 352-353) **Determining the lifetime of the π/sup +-/μ/sup -+/ atom.** Schwartz, M. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

An experiment to measure the lifetime of the (π/sup +-/μ/sup -+/ atom, produced in K°/sub L/ decay, is discussed.

3705 (LA—9798-P, pp 354-356) **Fundamental symmetries and interactions using muons.** Heffner, R.H. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Experiments with muons which may be performed at LAMPF II are discussed including rare muon decays, the measurement of the anomalous g-value for the muon, tests of time-reversal symmetry and V-A structure in muon decay, muonium and muonic atom experiments, and studies on muon capture in nuclei. (WHK)

3706 (LA—9798-P, pp 357-361) **Muon capture.** Deutsch, J. (Louvain Univ., Belgium). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

This paper outlines some of the problems in muon capture that justify both renewed efforts and development of improved experimental facilities. We discuss briefly the nature of these anticipated improvements using the LAMPF II stopping muon beams. 25 references.

3707 (LA—9798-P, pp 362-368) **Rare muon decay.** Cooper, M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

This report reviews contributions that rare muon decay can make to our understanding of the particle generations and emphasizes the experimental situation and the improvements that can be made by new facilities.

3708 (LA—9798-P, pp 369-375) **Rare processes.** Souder, P.A. (Yale Univ., New Haven, CT). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A discussion of the scientific interest and experimental feasibility for measurements of the conversion of a muon into an electron in a muonic atom and of the spontaneous conversion of muonium into antimuonium is presented. The importance of high-intensity, pulsed LAMPF II beams for these measurements is emphasized. 34 references.

3709 (LA—9798-P, pp 376-380) **Muon g/sub μ/-2 experiment.** Hughes, V.W. (Yale Univ., New Haven, CT). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A LAMPF II experiment that improves significantly upon the CERN muon g/sub μ/-2 measurement is described. More precise measurements of the hadronic contributions to g/sub μ/-2 coupled with the expected large muon flux from LAMPF II would allow a determination of the weak-interaction contribution to g/sub μ/-2 to within ~ 25%.

3710 (LA—9798-P, pp 381-382) **Test of time-reversal symmetry and V-A structure of muon decay.** Boehm, F. (California Inst. of Tech., Pasadena); McKeown, R.; Vogel, P.; Chen, H.H.; Mahler, H.J. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We propose to examine the real and imaginary parts of the ratio of the vector and axial vector coupling constants in the purely leptonic process μ → e nu nu.

3711 (LA—9798-P, pp 391-393) **Muon capture from the triplet hyperfine level in hydrogen.** Heffner, R.H. (Los Alamos National Lab., NM); Leon, M.; Walecka, J.D. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The feasibility of measuring the muon capture rate from the triplet hyperfine level in muonic hydrogen is discussed. An experiment using a tunable, pulsed laser to pump some population from the singlet to the triplet state is evaluated.

3712 (LA-UR—83-3096) **No-neutrino double beta decay: more than one neutrino.** Rosen, S.P. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 8p. (CONF-8309163—2). NTIS, PC A02/MF A01. Order Number DE84001748.

From Conference on low energy tests of conservation laws in particle physics; Blacksburg, VA, USA (12 Sep 1983).

Interference effects between light and heavy Majorana neutrinos in the amplitude for no-neutrino double beta decay are discussed. The effects include an upper bound on the heavy neutrino mass, and an A dependence for the effective mass extracted from double beta decay. Thus the search for the no-neutrino decay mode should be pursued in several nuclei, and particularly in $Ca^{48}$, where the effective mass may be quite large.

3713 (SLAC—262) **Quark flavor identification in electron-positron annihilation.** Kaye, H.S. (Stanford Linear Accelerator Center, CA (USA)). Sep 1983. Contract AC03-76SF00515. 64p. NTIS, PC A04/MF A01. Order Number DE84002349.

Thesis.

The theoretical issues relevant to inclusive muon analysis, the MAC detector and its data flow structure, the identification of muons in hadronic events and the measurement of their momenta, and the selection of events so as to minimize background are described. Experimental results are presented describing the fragmentation of heavy quarks into hadrons, the semimuonic branching fractions of the heavy quarks, the asymmetry in the angular distribution of the heavy quarks, and the invariant mass and charged multiplicity of heavy quark jets. In addition, lower limits are set on the masses of certain proposed particles that are expected to decay semileptonically. Finally, events containing two muons are analyzed in order to investigate the possibility of mixing in the B-B system and whether the b might form its own SU(2) singlet.

3714 (SLAC-PUB—3129) **Radiative corrections to $e^+e^-$ reactions to all orders in α using the renormalization group.** Tsai, Y.S. (Stanford Linear Accelerator Center, CA (USA)). 1983. Contract AC03-76SF00515. 27p. (CONF-830631—2). NTIS, PC A03/MF A01. Order Number DE84002034.

From 6. biennial wind energy conference; Minneapolis, MN, USA (1 Jun 1983).

Renormalization group technique is used to improve the accuracy of the lowest order radiative corrections in QED. The exponentiation of infrared terms comes automatically. It also leads to exponentiation of the vertex functions. It predicts the existence of conversion of photons into pairs and the result agrees with the Kroll-Wada relation. Kinoshita-Lee-Nauenberg cancellation of mass singularities occurs to all order in $\alpha$ in leading log approximation in the final state if we sum over all the final states. Higher order corrections to the order $\alpha^3$ asymmetry is shown to be small. The results are used to derive useful formulas for the radiative corrections to processes such as $e^+e^- \rightarrow \mu^+\mu^-$, $e^+e^- \rightarrow \mu^+\mu^-\gamma$, $e^+e^- \rightarrow$ hadron continuum, $e^+e^- \rightarrow$ very narrow resonance such as phi, and $e^+e^- \rightarrow$ not very narrow resonance such as $Z^0$.

3715 **(SLAC-PUB—3202) First results from MARK III at SPEAR. MARK III collaboration.** Einsweiler, K.F. (Stanford Linear Accelerator Center, CA (USA); Stanford Univ., CA (USA)). Sep 1983. Contract AC03-76SF00515. 3p. (CONF-830718—12). NTIS, PC A02/MF A01. Order Number DE84002020.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

The MARK III detector, operating at SPEAR, has collected $\sim 2.7 \times 10^6$ phi decays and 4500 $nb^{-1}$ of phi" decays. Preliminary results from the full phi samples are presented.

3716 **Measurement of the lifetime of bottom hadrons.** Lockyer, N.S.; Jaros, J.A.; Nelson, M.E.; Abrams, G.S.; Amidei, D.; Baden, A.R.; Blocker, C.A.; Boyarski, A.M.; Breidenbach, M.; Burchat, P. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305; Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720; and Department of Physics, Harvard University, Cambridge, Massachusetts 02138). *Physical Review Letters;* **51**: No. 15, 1316-1319(10 Oct 1983). Contract AC03-76SF00515;W-7405-ENG-48;AC03-76SF00098.

The average lifetime of bottom hadrons was measured with the Mark II vertex detector at the storage ring PEP. The lifetime was determined by measuring the impact parameters of leptons produced in bottom decays. tau/sub b/ = (12.0/sub -3.6//sup +4.5/ +- 3. 0) x $10^{-13}$ sec was found.

3717 **New measurement of deep-inelastic e-p asymmetries.** Baum, G.; Bergstroem, M.R.; Bolton, P.R.; Clendenin, J.E.; DeBotton, N.R.; Dhawan, S.K.; Guo, Y.; Harsh, V.; Hughes, V.W.; Kondo, K. (Institute of High Energy Physics, Beijing, China; University of Bern, CH-3012 Bern, Switzerland; University of Bielefeld, D-4800 Bielefeld, Federal Republic of Germany; National Laboratory for High Energy Physics, KEK, Tsukuba, Japan; Kyoto University, Kyoto, Japan; Centre d'Etudes Nucleaires, Saclay). *Physical Review Letters;* **51**: No. 13, 1135-1138(26 Sep 1983). Contract AC03-76SF00515.

Spin-dependent asymmetries have been measured in inclusive deep-inelastic scattering of longitudinally polarized electrons by longitudinally polarized protons. Data were obtained at a scattering angle of $10^0$ and for incident energies of 16.2 and 22.7 GeV, which cover the kinematic range $0.18<x<0.70$ and $3.5<Q^2<10.0$ $(GeV/c)^2$. The present results provide a test of scaling and of the Bjorken and Ellis-Jaffe sum rules and are compared with various models of proton spin structure.

3718 **Production of charmed mesons in $e^+e^-$ annihilation at 10.5 GeV.** Avery, P.; Bebek, C.; Berkelman, K.; Cassel, D.G.; DeWire, J.W.; Erlich, R.; Ferguson, T.; Galik, R.; Gilchriese, M.G.D.; Gittleman, B. (Cornell University, Ithaca, New York 14853). *Physical Review Letters;* **51**: No. 13, 1139-1142(26 Sep 1983).

A measurement is presented of the inclusive production of charged D( and neutral D mesons from nonresonant $e^+e^-$ annihilation in the energy region near the Y(4S) resonance. The momentum distribution shows a large contribution at high momenta as expected for heavy quark production. Comparison of the spectrum with several phenomenological models is made. The relative yields of the D( and D mesons indicate that the charm cross section is dominated by the D( contribution.

3719 **Observation of baryons in B-meson decay.** Alam, M.S.; Csorna, S.E.; Garren, L.; Mestayer, M.D.; Panvini, R.S.; Yi, X.; Giles, R.; Hassard, J.; Hempstead, M.; Kinoshita, K. (Vanderbilt University, Nashville, Tennessee 37235). *Physical Review Letters;* **51**: No. 13, 1143-1146(26 Sep 1983).

In a sample of B mesons from the decay of the Y(4S) produced in $e^+e^-$ collisions at the Cornell Electron Storage Ring, inclusive protons, antiprotons, lambdas and antilambdas have been observed. Lower limits to the B-to-baryon branching ratios are derived.

3720 **Inclusive D and D/sup/ production in $e^+e^-$ annihilation at 29 GeV.** Ahlen, S.; Akerlof, C.; Baranko, G.; Baringer, P.; Beltrami, I.; Bender, D.; Blockus, D.; Brabson, B.; Chapman, J.; Cho, Y. (Argonne National Laboratory, Argonne, Illinois 60439; Indiana University, Bloomington, Indiana 47405; Lawrence Berkeley Laboratory, Berkeley, California 94720; University of Michigan Ann Arbor, Michigan 48109; Purdue University, W. Lafayette, Indiana 47907; and Stanford Linear Accelerator Center, Stanford). *Physical Review Letters;* **51**: No. 13, 1147-1150(26 Sep 1983).

Inclusive production of ($D^0$,D-bar $^0$) and $D^{+-}$ mesons has been observed in $e^+e^-$ annihilation at 29 GeV. The signals correspond to R values of $R(D^0+D^0) = 3.25$ +- 1.2 and $R(D^+ + D^-) = 1.35$ +- 0.6. D/sup asteriskplus-or-minus/ production is also observed via the process D/sup asterisk+/$\rightarrow D^0\pi^+$ and its charge conjugate. The D and D( production rates are compared.

3721 **Precision measurement of the magnetic moment of the $\Sigma$p hyperon.** Hertzog, D.W.; Eckhause, M.; Giovanetti, K.L.; Kane, J.R.; Phillips, W.C.; Vulcan, W.F.; Welsh, R.E.; Whyley, R.J.; Winter, R.G.; Dodson, G.W. (College of William and Mary, Williamsburg, Virginia 23185). *Physical Review Letters;* **51**: No. 13, 1131-1134(26 Sep 1983).

The magnetic moment of the $\Sigma^-$ hyperon has been obtained from measurements of fine-structure splittings of x-ray transitions in $\Sigma^-$ exotic atoms. The use of targets consisting of sheets of Pb or W immersed in liquid hydrogen, and of a tagging technique utilizing the $\pi^+$ emitted in the reaction $K^-p \rightarrow \Sigma^-\pi^+$, resulted in improved x-ray signal-to-noise ratio by a factor of 15 over that in previous experiments. The present result is $\mu(\Sigma^-) = (-1.111$ +- 0.031 +- 0. 011)$\mu$/sub N/. .AE

3722 **Electron-positron annihilation cross section in SU(2)/sub L/xU(1) supergravity.** Dicus, D.A.; Nandi, S.; Repko, W.W.; Tata, X. (Center for Particle Theory, The University of Texas at Austin, Austin, Texas 78712). *Physical Review Letters;* **51**: No. 12, 1030-1033(19 Sep 1983).

For a wide range of masses of the W superpartners and the supersymmetric scalars it is shown that a measurement of the total electron-positron annihilation cross section is sufficient to demonstrate the existence or nonexistence of supersymmetry.

3723 **Lifetime of particles containing b quarks.** Fernandez, E.; Ford, W.T.; Read, A.L. Jr.; Smith, J.G.; De Sangro, R.; Marini, A.; Peruzzi, I.; Piccolo, M.; Ronga, F.; Blume, H.T. (Department of Physics, University of Colorado, Boulder, Colorado 80309). *Physical Review Letters;* **51**: No. 12, 1022-1025(19 Sep 1983). Contract AC02-81ER40025.

From a sample of hadronic events, produced in $e^+e^-$ collisions, semileptonic decays of heavy particles have been isolated and used to obtain a measurement for the bottom-quark lifetime of [1.8 +- 0.6(stat.) +- 0.4(syst.)] x $10^{-12}$ sec.

**3724 Precise measurement of the tau lifetime.** Jaros, J.A.; Amidei, D.; Trilling, G.H.; Abrams, G.S.; Blocker, C.A.; Boyarski, A.M.; Breidenbach, M.; Burke, D.L.; Dorfan, J.M.; Feldman, G.J. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305; Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720; and Department of Physics, Harvard University, Cambridge, Massachusetts 02138). *Physical Review Letters;* **51**: No. 11, 955-958(12 Sep 1983). Contract AC03-76SF00515;W-7405-ENG-48;AC03-76SF00098.

The tau lifetime was measured with the Mark II vertex detector at the storage ring PEP. tau/sub tau/ = (3.20 +- 0.41 +- 0.35) x $10^{-13}$ sec was found, which agrees well with e-$\mu$-tau universality.

**3725 Inclusive production of direct photons in 200-GeV/c collisions.** McLaughlin, M.; Biel, J.; Bromberg, C.; Brown, B.; Chandlee, C.; Cihangir, S.; Cooper, S.R.W.; Ferbel, T.; Garelick, D.; Glass, G. (Fermilab, Batavia, Illinois 60510; Michigan State University, East Lansing, Michigan 48824; University of Minnesota, Minneapolis, Minnesota 55455; Northeastern University, Boston, Massachusetts 02115; and University of Rochester, Rochester, New York 14627). *Physical Review Letters;* **51**: No. 11, 971-974(12 Sep 1983).

The authors have measured the inclusive production of direct photons in the transverse momentum (p/sub T/) range 2.1—5.0 GeV/c in 200-GeV/c collisions of protons and $\pi^+$ mesons on a carbon target. A significant yield of direct photons was observed for p/sub T/>2.5 GeV/c. The invariant cross section for direct-photon production, when compared with measurements from the CERN intersecting storage rings, can be expressed in terms of p/sub T/ and x/sub T/ = 2p/sub T/root-bars as (42 +- 14)(1-x/sub T/)/sup 8.1plus-or-minus1.0/p /sub T//sup -6.6plus-or-minus0.3/ $\mu$b/GeV$^2$ for the c.m. energy range from $\sqrt{s}$ = 19.4 to 63 GeV, and for the x/sub T/ range from 0.2 to 0.5.

**3726 Measurement of psi(3097) and psi'(3686) decays into selected hadronic modes.** Franklin, M.E.B.; Feldman, G.J.; Abrams, G.S.; Alam, M.S.; Blocker, C.A.; Blondel, A.; Boyarski, A.M.; Breidenbach, M.; Burke, D.L.; Carithers, W.C. . (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305 and Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 11, 963-966(12 Sep 1983). Contract AC03-76SF00515;W-7405-ENG-48.

Measurements of psi(3097) and psi'(3686) branching fractions for selected hadronic decays are presented. The ratio of psi' to psi branching fractions for these decays is consistent with the ratio of branching fractions to lepton pairs, with the exception of the decays to rho$\pi$ and K(K for which this ratio is substantially smaller.

**3727 Existence of Ξ resonances above 2 GeV.** Jenkins, C.M.; Albright, J.R.; Diamond, R.N.; Fenker, H.; Goldman, J.H.; Hagopian, S.; Hagopian, V.; Morris, W.; Kirsch, L.; Poster, R. (Florida State University, Tallahassee, Florida 32306). *Physical Review Letters;* **51**: No. 11, 951-954(12 Sep 1983).

Ξ/sup asterisk-/ production was studied in the reaction $K^- + p \rightarrow$ K/sub slow/$^+ + X^-$ at 5 GeV/c. The slow $K^+$ was electronically detected, while the $X^-$ was observed as a missing mass, thus allowing for observation of all Ξ( independent of decay mode. The observed Ξ states were Ξ(1320), Ξ(1530), Ξ(1820), Ξ(2030), Ξ(2250), Ξ(2370), and Ξ(2500). These data establish and confirm the existence of Ξ((2250) and indicate a peculiar production-cross-section behavior for the Ξ((2370).

**3728 Study of the decay J/psi→γetaππ.** Edwards, C.; Partridge, R.; Peck, C.; Porter, F.C.; Antreasyan, D.; Gu, Y.F.; Kollman, W.; Richardson, M.; Strauch, K.; Weinstein, A. . (Physics Department, California Institute of Technology, Pasadena, California 91125). *Physical Review Letters;* **51**: No. 10, 859-862(5 Sep 1983). Contract AC03-76SF00515;AC02-76ER03064;AC03-81ER40050;AC02-76ER03072.

The radiative decay J/psi→γνππ has been studied with data taken with the crystal ball detector at the SPEAR $e^+e^-$ storage ring. In addition to the well-known eta', the etaππ mass spectrum shows a broad enhancement centered at ~1700 MeV. The authors have searched for the iota(1440) in the etaππ mass spectrum and find R(J/psi→γiota)(iota→etaππ)/R(J/psi→γiota)(iota→KKπ)<0.5 (90% confidence level).

**3729 Precise measurement of the Σi magnetic moment.** Ankenbrandt, C.; Berge, J.P.; Brenner, A.E.; Butler, J.; Doroba, K.; Elias, J.E.; Lach, J.; Laurikainen, P.; MacLachlan, J.; Marriner, J. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Physical Review Letters;* **51**: No. 10, 863-866(5 Sep 1983). Contract AC02-76CH03000;AC02-76ER03075.

The $\Sigma^+$ magnetic moment is measured to be (2.38 +- 0.02)$\mu$/sub N/ with use of 44 457 polarized $\Sigma^+ \rightarrow p\pi^0$ decays in a charged hyperon beam. The inclusively produced $\Sigma^+$ in this 210 GeV/c beam have a polarization of about 0.20 for production angles between 2.5 and 7.0 mrad.

**3730 Search for fractional charges in water.** Joyce, D.C.; Abrams, P.C.; Bland, R.W.; Johnson, R.T.; Lindgren, M.A.; Savage, M.H.; Scholz, M.H.; Young, A.B.A.; Hodges, C.L. (Physics and Astronomy Department, San Franciso State University, San Francisco, California 94132). *Physical Review Letters;* **51**: No. 9, 731-734(29 Aug 1983). Contract AC03-81ER40009.

Results are presented from a search for fractional charges in water from a variety of natural sources. About 30 000 water drops have been measured, comprising 51 μg of water and dissolved materials. No evidence for fractional charge was seen.

**3731 Measurement of the ν/sub μ/ charged-current cross section.** Baker, N.J.; Connolly, P.L.; Kahn, S.A.; Murtagh, M.J.; Tanaka, M.; Baltay, C.; Bregman, M.; Caroumbalis, D.; Chen, L.D.; French, H. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters;* **51**: No. 9, 735-738(29 Aug 1983).

The Fermilab 15-ft bubble chamber, filled with a heavy neon-hydrogen mix, was exposed to a narrow-band ν/sub μ/ beam. Based on the observation of 830 charged-current ν/sub μ/ interactions, the cross section was found consistent with a linear rise with the neutrino energy in the interval 10 GeV< or =E/sub ν/< or ≈240 GeV. The average slope was determined to be σ/sub ν//E/sub ν/ = (0.62 +- 0.05) x $10^{-38}$ cm$^2$ GeV$^{-1}$.

**3732 nu-bar/sub μ/-nucleon charged-current total cross section for 5—250 GeV.** Taylor, G.N.; Cence, R.J.; Harris, F.A.; Jones, M.d; Parker, S.I.; Peters, M.W.; Peterson, V.Z.; Stenger, V.J.; Ballagh, H.C.; Bingham, H.H. (Department of Physics and Astronomy, University of Hawaii, Honolulu, Hawaii 96822). *Physical Review Letters;* **51**: No. 9, 739-742(29 Aug 1983).

The nu-bar/sub μ/ charged-current total cross section has been measured with the Fermilab 15-ft bubble chamber plus the external muon identifier and internal "picket fence." Beam monitoring information used for the flux calculation was obtained from Blair et al., whose detector operated in the same dichromatic beam. The present result, aver p- aged over nu-bar/sub μ/ energies from 5 to 250 GeV, is σ/E = (0.340 +- 0.019 +- 0.022) x $10^{-38}$ cm$^2$/(GeV nucleon) for an isoscalar target.

3733 **Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment.** Ball, R.C.; Coffin, C.T.; Gustafson, H.R.; Jones, L.W.; Longo, M.J.; Roberts, T.J.; Roe, B.P.; Wang, E.; Castoldi, C.; Conforto, G. (University of Michigan, Ann Arbor, Michigan 48109). *Physical Review Letters;* **51**: No. 9, 743-746(29 Aug 1983).

The prompt $\nu$/sub $\mu$/ and nu-bar/sub $\mu$/ flux produced by 400-GeV protons has been measured with a detector located 56 m from a tungsten target. The cross section for the hadronic production of charm is determined to be 27 +- 4 +- 5 $\mu$b/nucleon subject to the following assumptions: DD-bar production only; $A^1$ variation of cross section; and a parametrization of the D-production cross section which is $(1-x)^4 \exp(-2m/\text{sub perpendicular/})$. The ratio of prompt nu-bar/sub $\mu$/ flux to prompt $\nu$/sub $\mu$/ is measured to be 1.12 +- 0.24 +- 0.17, consistent with predominantly DD-bar production.

3734 **Energy variation of the analyzing power in the reaction p/sub pol/$+p \rightarrow d+\pi^+$.** Saha, A.; Seth, K.K.; Kielczewska, D.; Iversen, S.; Kaletka, M.; Barlow, D.; Smith, A.D. (Northwestern University, Evanston, Illinois 60201). *Physical Review Letters;* **51**: No. 9, 759-762(29 Aug 1983).

Precision measurements of the analyzing powers for the reaction p/sub pol/$+p \rightarrow d+\pi^+$ have been made at ≈550, 600, 650, 700, and 800 MeV. The data have been analyzed in terms of Legendre polynomials. It is found that excitation functions for both even and odd Legendre coefficients exhibit very similar resonant behaviors. It is concluded that the triplet amplitudes are as strongly dominated by the $\Delta(1232)$ as the well-known singlet amplitude, $^1D_2$, and that the data do not exhibit any anomalous behavior suggestive of dibaryon resonances.

3735 **Search for right-handed currents in muon decay.** Carr, J.; Gidal, G.; Gobbi, B.; Jodidio, A.; Oram, C.J.; Shinsky, K.A.; Steiner, H.M.; Stoker, D.P.; Strovink, M.; Tripp, R.D. (Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 8, 627-630(22 Aug 1983). Contract AC03-76SF00098.

New limits are reported on right-handed currents, based on precise measurement of the $e^+$ spectrum end point in $\mu^+$ decay. Highly polarized muons from the TRIUMF "surface" beam were stopped in metal foils within a 1.1-T spin-holding longitudinal field or a 70-G spin-precessing transverse field. For the spin-held data, the V-A decay rate vanishes in the beam direction at the end point. Measurement of this rate sets the 90%-confidence limits $\xi$P/sub $\mu$/ $\delta$/rho>0.9959 and M(W/sub R/)>380 GeV, where W/sub R/ is the possible right-handed gauge boson.

3736 **Evidence for the F meson at 1970 MeV.** Chen, A.; Goldberg, M.; Horwitz, N.; Jawahery, A.; Lipari, P.; Moneti, G.C.; Trahern, C.G.; Van Hecke, H.; Alam, M.S.; Csorna, S.E. (Syracuse University, Syracuse, New York 13210). *Physical Review Letters;* **51**: No. 8, 634-637(22 Aug 1983).

Evidence is presented for a narrow meson resonance of mass 1970 +- 5 +- 5 MeV produced in continuum $e^+e^-$ annihilations at $\sqrt{s}$ of 10.5 GeV, and decaying into a phi and a charged $\pi$.

## 6452 Particle Interactions And Properties - Theoretical

*REFER ALSO TO CITATION(S) 3708, 3848, 3937, 3955*

3737 **(CEA-CONF—6648) Prospects in the study of very inelastic electronuclear reactions.** Laget, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Mar 1983. 24p. (CONF-830394—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700064.

From 7. biennial meeting of nuclear physics; Aussois, France (14 Mar 1983).

Nuclear physics has reached a frontier where it is not possible to consider the classical constituents (mesons and nucleons) as inert objects: it is necessary to take also into account internal structure. After having shown how the study of nuclei, with the electromagnetic probe, has made it possible to solve and clarify some problems, it is shown under what conditions these internal degrees of freedom can show up in the study of electronuclear reactions, and to what extent the study of complex hadronic systems at short distance is an essential complement to the study of high momentum scattering between elementary hadrons.

3738 **(CEA-N—2324) Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions.** Peyaud, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France); Paris-7 Univ., 75 (France)). Feb 1983. 166p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE84700053.

The analysis of like-sign dimuons (587 $\mu^-\mu^-$ events induced by neutrinos and 115 $\mu^+\mu^+$ induced by antineutrinos) requires a detailed calculation of the non prompt background from a charged-current event in which a $\pi \rightarrow \mu\nu$ or $K \rightarrow \mu\nu$ decay occurs. We have calculated this background by the Monte Carlo method and we show evidence for the existence of a prompt signal which is respectively $(4.1+-1.5)10^{-5}$ and $(5.9+-1.7)10^{-5}$ relative to the charged current and for a muon momentum cut of 6.5 GeV/c. We also show that in the kinematical distributions of the $\mu^-\mu^-$ events there is evidence that $\pi$ or $K \rightarrow \mu\nu$ cannot account for all events and we conclude that there must be a prompt signal. This prompt signal is explained only qualitatively by associated charm production which however fail to account for the magnitude. The interpretation of the trimuon events (165 events from the neutrino beam and 33 events from the antineutrino beam) is done in terms of two "classical" components. The first component is a radiative part (internal bremsstrahlung) and the second component is due to muon pair production at the hadron vertex. These trimuon events are used to set some limits on heavy lepton production and bottom quark production in neutrino interaction.

3739 (CERN—83-02-Vol.2, pp 392-395) **Polarization as a tool for studying the physics of weak interactions.** Soffer, J. (Centre National de la Recherche Scientifique, 13 - Marseille (France). Centre de Physique Theorique). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

Realistic possibilities exist now to obtain high-energy polarized proton beams with high luminosity and to measure the polarization of a stored beam. This will be our motivation to discuss parity violating weak effects in inclusive hadron and jet production with polarized beams. There are also interesting predictions for helicity asymmetries in Wsup(+-) and Z production in pp and panti p collisions.

3740 **(DOE/ER/03992—0527) Triple Reggeon interactions and Reggeon dynamics in high-energy collisions.** Chiu, C.B. (Texas Univ., Austin (USA). Center for Particle Theory). Aug 1983. Contract AS05-76ER03992. 21p. (CONF-830689—10). NTIS, PC A02/MF A01. Order Number DE84002843.

From 14. international symposium on multiparticle dynamics; Lake Tahoe, NV, USA (22 Jun 1983).

We show that in the triple-Regge region, there are ample data confirming the dominance of the RRP interactions. Also we recall that the triple-Pomeron features are present in the diffractive data. This success of Regge phenomenology suggests that the notion of Reggeon dynamics is still very useful. In this context we review two promising approaches, the extended eikonal models and the critical Pomeron solution in the Reggeon field theory for the Pomeron.

3741 **(DOE/ER/40048—22-N3) Dynamics of the soliton bag.** Wilets, L.; Goldflam, R. (Washington Univ., Seattle (USA). Inst. for Nuclear Theory). Sep 1983. Contract AC06-81ER40048. 7p. (CONF-8306136—2). NTIS, PC A02/MF A01. Order Number DE84001542.

From International symposium on quarks and nuclear structure; Bad Honnef, F.R. Germany (13 Jun 1983).

Portions are illegible in microfiche products.

The MIT bag was one of the earliest and most successful models of QCD, imposing confinement and including perturbative gluon interactions. An evolution of the MIT bag came with the introduction of the chiral and cloudy bags, which treat pions as elementary particles. As a model of QCD, the soliton model proposed by Friedberg and Lee is particularly attractive. It is based on a covariant field theory and is sufficiently general so that, for certain limiting cases of the adjustable parameters, it can describe either the MIT or SLAC (string) bags. The confinement mechanism appears as a dynamic field. This allows non-static processes, such as bag oscillations and bag collisions, to be calculated utilizing the well-developed techniques of nuclear many-body theory. The utilization of the model for calculating dynamical processes is discussed. 14 references. (WHK)

3742 **(EFI—494(37)-81) Inclusive spectra of hadrons in photon-nucleus collisions.** Gevorkyan, S.R.; Zhamkochyan, V.M. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704005.

Inclusive hadron productin in the $\gamma A \rightarrow hX$ photon-nucleus interaction is investigated. It is shown that, as in the case of the photoabsorption total cross sections, in the inclusive spectra of hadrons with the rise of photon energy the hadron component of the photon begins to dominate. This leads to the charge in the A-dependence of inclusive spectra which does not contradict the available experimental data.

3743 **(EFI—530(17)-82) Renormalizability of reggeon field theory with account of thresholds and mass terms at D = 2.** Eremyan, Sh.S.; Nazaryan, A.E. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703970.

It is shown that the account of the reggeon production thresholds $x_{i_0}=\ln(M^2/S_0)$ approximately 2 in the Reggeon field theory results in the fact that the epsilon-expansion becomes analytical at epsilon=2 and the simultaneous limiting transition to epsilon $\rightarrow$ 2 and E $\rightarrow$ 0 becomes possible which is consistent with the physical space dimension in the asymptotic energy region. The introduction of thresholds facilitates the accomplishment of perturbation theory calculations at D=2 eliminating the ultraviolet divergences of theory and proves useful for the accomplishment of smooth matching of the perturbation theory and asymptotic solutions.

3744 **(EFI—533(20)-82) Reggeon field theory at D = 2 in two-loop approximation.** Eremyan, Sh.S.; Nazaryan, A.E. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 45p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703971.

A general method of constructing an explicit representation is developed for the pomeron propagator in the presence of additional parameters, such as the pomeron production threshold $x_{i_0}$, momentum transfer K vector or the intercept shift $delta_0$. The method is shown to be applicable in both one-loop and two-loop approximations. The obtained general formulae allow to consider the pomeron propagator in both asymptotic region and the region of the perturbation theory applicability. Besides, they provide the smooth matching of both these regions. The observed values are calculated, and the results connected with asymptotically high energies are discussed.

3745 **(IC—80/2) Instanton-anti-instanton interaction in the O(3) non-linear $\sigma$ model and an exactly soluble fermion theory.** Bukhvostov, A.P.; Lipatov, L.N. (International Centre for Theoretical Physics, Trieste (Italy)). Jan 1980. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704009.

We calculate the potential energy of weak interacting instanton and anti-instanton quarks in the O(3) non-linear $\sigma$ model, which leads us to a two-component massive fermion theory. The exact solution for the ground state of the theory is built.

3746 **(IC—80/6) Deuteron D-wave and the non-eikonal effects in tensor asymmetries in elastic proton-deuteron scattering.** Alberi, G.; Bleszynski, M.; Santos, S.; Jaroszewicz, T. (International Centre for Theoretical Physics, Trieste (Italy)). Jan 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704015.

It is shown that the tensor asymmetries in the elastic proton-deuteron scattering at medium energies are very sensitive to the non-eikonal corrections to the Glauber model. This sensitivity originates from the fact that, in double scattering, the non-eikonal corrections affect in a different way the contributions coming from the S- and D-wave parts of the deuteron wave function. This leads to considerable change of the tensor asymmetries not only in the region of the interference between single and double scatterings, but also in the region of dominance of the double scattering. It is suggested that these effects should be taken into account in any careful analysis of the proton-deuteron polarization data, which has as a goal the extraction of the NN amplitudes.

3747 **(IC—80/26) Critical analysis of the electromagnetic mass shift problem in QCD.** Craigie, N.S.; Narison, S.; Riazuddin. (International Centre for Theoretical Physics, Trieste (Italy)). Feb 1980. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704010.

The paper analyzes the electromagnetic quark mass shift problem in the framework of QCD and concludes with a physically appealing sum rule for the proton neutron mass difference, in which the contribution from the divergent part of the photon loop has the right sign, after it has been renormalized. The paper reconciles the conflicting conclusions reached by respectively using the operator product expansion and the Dyson equations. In a recent discussion based on the latter special significance was given to the number of flavours $nsub(f) > 11$, for which by choosing the ordering of integration and summation naturally dictated by iteration of the Dyson equation, the electromagnetic mass shift comes out to be finite with the correct sign for msub(u) - msub(d). We show by using dimensional regularization and minimal subtraction for renormalization group improved Feynman graphs one obtains the same result independent of the number of flavours.

3748 **(IC—80/49) Are lepton and quark families quantized dynamical systems.** Krolikowski, W. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704011.

Lepton and quark families ($\nu$sub(N)), (esub(N))) and (usub(N)), (dsub(N) are conjectured to be quantum-dynamical systems in the space of generations N = 0,1,2,... Such a conjecture, called the "zeroth quantization", implies the form of lepton and quark mass spectra, if lepton and quark families are supposed to be almost in thermal equilibrium with the rest of the Universe. Toponium is predicted at about 38 GeV, while the next charged lepton at 28.5 GeV.

3749 **(IC—80/50) Role of interaction in neutrino statistics. In memory of Bronislaw Kuchowicz.** Deppert, W. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1980. 26p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704012.

The paper sets out to examine the role of interaction in neutrino statistics with the aid of the MATSUBARA method for calculation of thermodynamic potentials. For this purpose, a first step involves the use of the V-A interaction Hamilton operator. Estimations show that the relative effects of this interaction cannot exceed the very small value of $10^{-6}$. In a second step it is shown that even by using the Hamilton operator of the Weinberg-Salam theory this result does not change. This means that the neutrino statistics calculated by Kuchowicz do not need to be revised as a result of interaction effects. Discussions are made on the possibility of symmetry restoring at a critical temperature kTsub(c) approx.= 100 GeV. This idea is extended to the grand unification scheme and some speculative conclusions are drawn.

3750 **(IC—80/52) Problem of the deuteron smearing corrections - 1: the conventional approach.** Kusno, D.; Moravcsik, M.J. (International Centre for Theoretical Physics, Trieste (Italy)). May 1980. 59p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704013.

A comprehensive analysis to the problem of deuteron smearing corrections is given. Some problems of the usual approach (conventional approach) are discussed. It is shown that the formalism adopted by this approach leads to i) the existence of the so-called West $\beta$ corrections and ii) the disagreement of the sum rules with the quark parton model expectations in leptonic scattering. It is also shown that in this formalism the electroproduction expression is not inconsistent, and hence, in contradiction with Bodek's conclusion. Following West for the identification of the wave function, it is found that the smearing correction $\sigma$sub(s) of the high-energy (50-370 GeV) pion - and nucleon - process is non-negligible, and hence, in contradiction with the usual expectation. Another test for this approach is suggested.

3751 **(IC—80/86) Density of states, Poisson's formula of summation and Walfisz's formula.** Fucho, P. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1980. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704017.

Using Poisson's formula for summation, we obtain an expression for density of states of d-dimensional scalar Helmoholtz's equation under various boundary conditions. Likewise, we also obtain formulas of Walfisz's type. It becomes evident that the formulas obtained by Pathria et al. in connection with ideal bosons in a finite system are exactly the same as those obtained by utilizing the formulas for density of states.

3752 **(IC—80/88) Global quantity for dyons with various charge distributions.** Koh, I.G.; Kim, Y. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1980. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704018.

The spatial volume integral of Tr *F F characterizes the dyons globally. This integral is investigated for the dyons with various electric and magnetic charge distributions, which can be probed by the scattering of the test particle in these dyon fields.

3753 **(IC—82/71) Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons.** Fakirov, D.G. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704032.

Semileptonic decays of charmed mesons of F and D types with tau lepton production are considered using as an example the energetically possible decay of $D^-$ sub(S) meson in $\pi^0$ and $tau^-$. As the mass msub(tau) of tau lepton is big we consider the mass effects in the decay spectrum which are very closely connected to form factor effects in our approach.

3754 **(IC—82/91) New vacuum structure, background strength and confinement.** Wang, K.L. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704034.

In this paper we further extend the definition of the winding number. The Lagrangian of pure Y-M field system is written in the winding number space as the "kinetic" and "potential" energy parts, the "potential" energy part corresponds to a periodic potential. Therefore, by analogy to the results of solid state physics, the lowest energy state of the system is shown to have the energy band structure. This new vacuum state is shown to satisfy general requirements. Using the band theory of the vacuum, we can give the bag model a clear interpretation and verify the existence of the background strength of the vacuum. The parameter B of the bag model and the background strength of the vacuum can be related to each other in this vacuum theory. The result made by comparison is satisfactory.

3755 **(IC—82/145) Hadronic couplings of open beauty states.** Ram, S.N.; Singh, C.P. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704026.

Strong interaction coupling parameters of particles with beauty quantum number are obtained using dispersion sum rules in various forms, e.g. current algebra sum rules, superconvergence sum rules and finite energy sum rules etc. These sum rules lead to a set of algebraic relations among masses and coupling constants. We compare the hadronic couplings of beautiful particles as obtained from various techniques and discuss their implications on the hadronic production of these states.

3756 **(IC—82/223) Note in the msub(quark) dependence of <q-barq> from chiral perturbation theory.** Christos, G.A. (International Centre for Theoretical Physics, Trieste (Italy)). Nov 1982. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704031.

Using known results from chiral perturbation theory and simple chiral Ward identities we obtain the estimates <s-bars>approx.=1.48<u-baru> and <d-bard>-<u-baru>/<u-baru>approx.=1.46x10$^{-2}$. The heavy quark expansion result is used to give an overall view of the msub(quark) dependence of <q-barq>.

3757 **(IFVE-OTF—82-22) Eigenvalue problem in the QCD simulating theory.** Arbuzov, V.A.; Kurennoy, S.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704038.

A simplified model of the interaction between "quarks" and "gluons" with the infrared asymptotics of the gluon propagator is considered. The requirement of a consistent description of "gluon" and "quark" propagators and a vertex function is shown to lead, in the particular covariant gauge, to an eigenvalue problem for the "magnetic moment" and the mass of the "quark". This eigenvalue problem has a unique solution in the model. The considered simplified theory can be interpreted as a model which describes qualitatively the situation in the infrared region for QSD.

3758 **(IFVE-OTF—82-38) Energy dependence of spin-spin correlation parameters in large-angle pp scattering.** Troshin, S.M.; Tyurin, N.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704040.

Three-dimensional dynamic equation in QFT for the scattering amplitude is used to analyse large-angle pp-scattering with account for all of its spin components. The expressions for spin-spin correlation parameters Asub(nn)($\pi$/2) and Asub(ll)($\pi$/2) have been obtained. They reveal oscillations with s exchange (where s is total energy square of system). Such a behaviour allows one to understand the experimental data, obtained at ZGS energies. The asymptotic values of the parameters Asub(nn)($\pi$/2) and Asub(ll)($\pi$/2) appear to be 1/3 and -1/3 respectively.

3759 **(IFVE-OTF—82-106) Some new results in classical theory of relativistic string.** Pron'ko, G.P.; Razumov, A.V.; Soloviev, L.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 16p. (CONF-820718—47). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703976.

From 21. international conference on high energy physics; Paris, France (29 Jul 1982).

A complete set of gauge invariant quantities has been constructed. The collective coordinate method is used which for the first time made it possible to construct all gauge invariant quantities. An analogous result has been obtained for the Ramond and Neveu-Schwarz spin strings. General properties of the classical string world surface have been investigated. It is shown that this surface may be singular and in three-dimensional space-time it must

be singular. It is shown that the singularities of the string world surface are tightly connected with singular solutions to of the Liouville equation.

3760 **(IFVE-OTF—82-112) Hadronic heavy flavour production from the 2 → 3 QCD subprocess.** Dubinin, M.N.; Slavnov, D.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704036.

The role of the 2 → 3 QCD subprocess qg → Q anti Qq (where Q - heavy quark) is considered in the reactions of hadronic charmed particle production. The total cross section of charmed quark production in pp collisions and c anti c inclusive spectrum from the 2 → 3 subprocess gq → c anti cq are presented. At the energies E > 200 GeV the third order contribution is larger than the contribution from 2 → 2 subprocesses. The heavy quark spectrum calculated in the third order decreases with the growth of Feynman variable x essentially slower than the second order spectrum.

3761 **(INIS-BR—81) Hadron phenomenology.** Santoro, A.F.S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). [nd]. 45p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704386.

Some important aspects in hadron phenomenology such as glueballs, the existence of diquarks, quark fusion and the flavor model are discussed.

3762 **(INIS-BR—85) Hadron spectroscopy.** Zagury, N. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). Nov 1981. 65p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83704387.

The main successes of the quark model and its application in the description of the hadrons mass spectra and of some of its static properties are reviewed.

3763 (INIS-SU—180, pp 112-115) **Gauge invariant Delbourgo approximation and gluon propagator.** Khelashvili, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The Delbourgo spectral representation is considered that linearizes the Dyson-Schwinger equation for the gluon propagator. The Delbourgo representation, when performing computations in the light-like calibration $n^2=0$, is shown to lead to the equation linearization without auxiliary suppositions. The spectral density (SD) equation is obtained which describes, in the approximation of basic logarithms, the SD behaviour both in the UV- and IR regions. The equation, as given in Delbourgo's work, presents different behaviours of SD in the regions indicated. The author states that the hope for a possible improvement of the result based on consideration of the terms set aside in Delbourgo's work is unjusted. It is necessary to more fully utilize the information contained in the Slavnov-Taylor identities.

3764 (INIS-SU—180, pp 5-14) **CP invariance problem in the quantum chromodynamics.** Krasnikov, N.V.; Matveev, V.A.; Tavkhelidze, A.N. 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The CP-invariance problem in QCD is reviewed. Non-Abelian gauge fields are the basis for constructing modern models of both electroweak and strong interactions. A quasiclassical analysis of non-Abelian theories points out to the possibility of occurrence in these theories of the ground state degeneration related with the so-called topological charge. The presence of degeneration gives evidence of a complicated structure of the vacuum state in gauge theories, that structure leading to serious physical consequencies. In particular, the so-called theta-structure of the vacuum in QCD discussed of late years may lead to the P- and CP-invariance violation in strong interactions.

3765 (INIS-SU—180, pp 35-42) **Tau lepton in 1980.** Azimov, Ya.I.; Khoze, V.A. (AN SSSR, Leningrad. Inst. Yadernoj Fiziki). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

A brief description is given of new data on studies of the tau-lepton and perspectives on its further investigations. The general properties of the $tau^{+-}$ lepton and $\nu sub(tau)$: mass, spin, theoretical lifetime are discussed as well as the structures of electromagnetic and weak vertices. The present relative probabilities (experimental and theoretical are tabulated for the decays $tau^- \rightarrow esup(-)anti\ \nu sub(e)\nu sub(tau)$, $tau^- \rightarrow \mu sup(-)anti\ \nu sub(\mu)\nu sub(tau)$, $tau^- \rightarrow \pi sup(-)\nu sub(tau)$, $tau^- \rightarrow ksup(-)\nu sub(tau)$, $tau^- \rightarrow rhosup(-)\nu sub(tau)$, $tau^- \rightarrow K^*sup(-)\nu sub(tau)$, $tau^- \rightarrow Asub(1)sup(-)\nu sub(tau)$, $tau^- \rightarrow \pi sup(-)\pi sup(-)\pi sup(+)\nu sub(tau)$, $tau^- \rightarrow \pi sup(-)rhosup(0)\nu sub(tau)$, $tau^- \rightarrow \nu sub(tau) + (>3$ charged particles$) + (>= o\pi^0)$. Probability constraints of $tau^+$ exotic decays are presented. The experimental data reflecting the nature of the $tau^{+-}$ lepton and $\nu sub(tau)$ and that of $tau^{+-}$ lepton decay are considered. The search for a neutral $N_0$ lepton and a heavier charged tau' lepton is underway. However, since the tau-lepton has not yet been studied experimentally completely, many of the properties discussed, such as the tau and $\nu sub(tau)$ lifetimes and masses, probabilities of ordinary and exotic decays, need additional experimental confirmation.

3766 (INIS-SU—180, pp 42-47) **Large angle scattering for nonlocal quasi-potentials.** Kvinikhidze, A.N.; Khvedelidze, A.M. (AN Gruzinskoj SSR, Tbilisskij Matematicheskij Inst.). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

To proceed the investigation into hadron elastic scattering, a class of nonlocal quasipotentials is considered that satisfies the suggested asymptotic condition and meets the requirement of convergence of integrals corresponding to any iteration of the quasipotential equation. A solution of the quasipotential equation is obtained for the amplitude of elastic scattering of particles with any spin in the range of high energies and fixed angles. A simple way is given for the determination of several first terms of expansion in power series $\sqrt{S}$ over the mass surface ($\sqrt{S}=\sqrt{p^2}$ vector$+m_1^2+\sqrt{p^2}$ vector$+m_2^2$, where p vector is the vector-momentum, $m_1$ and $m_2$ are masses of colliding particles). It is noticed that the representation obtained for the scattering amplitude may prove to be useful for the analysis of asymptotic topological quark diagrams.

3767 (INIS-SU—180, pp 116-121) **Large-angle hadron scattering at high energies.** Goloskokov, S.V.; Kudinov, A.V.; Kuleshov, S.P. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

Based on the quasipotential Logunov-Tavkhelidze approach, corrections to the amplitude of high-energy large-angle meson-nucleon scattering are estimated. The estimates are compared with the available experimental data on pp- and $\pi^{+-}$p-scattering, so as to check the adequacy of the suggested scheme to account for the preasymptotic defects. The compared results are presented in the form of tables and graphs. The following conclusions are drawn: 1. the account for corrections, due to the long-range interaction, to the amplitude gives a good agreement between the theoretical and experimental data. 2. in the case of $\pi^{+-}$p- scattering the corrections prove to be comparable with the main asymptotic term up to the values of transferred pulses psub(lambdac)=50 GeV/c, which results in a noticeable deviation from the quark counting rules at such energies. Nevertheless, the preasymptotic formulae do well, beginning with psub(lambdac) approximately 6 GeV/c. In case of pp-scattering the corrections are mutually compensated to a considerable degree, and the deviation from the quark counting rules is negligible.

3768 **(IPNO-TH—82-27) Spin dependence in N anti N at low energy.** Richard, J.M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1982. 4p. (CONF-8205103—0-Summ.). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704041.

From Workshop on physics at LEAR with low energy cooled antiprotons; Erice, Italy (9 May 1982).
Published in summary form only.

3769 **(IPNO-TH—83-02) Ground state baryons in the non-relativistic quark model.** Richard, J.M.; Taxil, P. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1982. 36p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700040.

We analyse the properties of the ground state baryons in the non-relativistic quark model. The three-body problem is solved by means of the hyperspherical expansion. We consider various two-body potentials of power law type and also a three-body linear potential. In displaying the results, we insist on quantities like ratios of splittings which are scale independent and are functions only of the power of the potential and of the ratio of quark masses.

3770 **(JINR—R-2-82-562) Constant of the baryon-meson strong interaction.** Dinejkhan, M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700042.

The coupling constants Gsub(NN$\pi$)sup(2)/4$\pi$, Gsub($\Sigma\Sigma\pi$)sup(2)/4$\pi$, Gsub($\Lambda$NK)sup(2)/4$\pi$ etc. are calculated within the framework of the virton-quark model. The obtained results are in satisfactory agreement with the experimental data.

3771 **(JINR—R-2-82-563) Relativistic wave functions of a nucleon as a quark-diquark bound state.** Linkevich, A.D.; Savrin, V.I.; Sanadze, V.V.; Skachkov, N.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700043.

Aproximate analytic solutions are obtained for the covariant three-dimensional equations for the wave function of a fermion, composed of two particles with spins 0 and 1/2 or 1 and 1/2, with an one-gluon exchange potential. The solutions will be used to calculate structural functions and other characteristics of a nucleon as a quark-di-quark bound state.

3772 **(JINR—R-2-82-832) Vector meson spin alignment in the fusion madel.** Efremov, A.V.; Teryaev, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700044.

The quark fusion is applied to describe the polarization characteristics of inclusive vector mesons. Satisfactory agreement with experimental data is achieved. The following is underlined: there are no reasons for "degeneration" of alignment with the growth of the energy or momentum transfer. The alignment gives exceptionally valuable information on the meson production mechanism.

3773 **(JINR—R-4-82-564) Primitives (eigenstates) of six-quark bags with an external pion field.** Efimov, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1982. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700045.

The $^1S_0$ channels of NN-interaction in the framework of the boundary condition model with the energy dependent logarithmic derivative is considered. It is supposed that the logarithmic derivative has the form which follows from the quark bag model, and that exists the external OPE-potential. The proposed model describes the $^1S_0$-phase of NN-scattering for the 0-515 MeV energy (lab. syst.) with chi$^2$ per point approximately 1.05. It permits to get corresponding six-quark primitives (eigenstates) for various values of radii of quark bag with external pion field.

3774 **(LA—9587-MS) Production of pions, kaons, and muons by 16-GeV protons.** Scheidker, E.J.; Thiessen, H.A. (Los Alamos National Lab., NM (USA)). Sep 1983. Contract W-7405-ENG-36. 51p. NTIS, PC A04/MF A01. Order Number DE84002320.

Cross sections for a variety of particles produced from a 16-GeV proton beam collision with target protons are calculated directly for specified momenta and angles. These results are compared with Monte Carlo calculations for particle production cross-sections: the Sanford-Wang cross-section formula and the Sanford-Wang cross-section fomula plus kinematic reflection. Some of these particles decay near the target, forming cloud daughter particles. Monte Carlo distributions of cloud pions from the decay K/sub short/$^0 \rightarrow \pi^+\pi^-$ and cloud muons from $\pi^+ \rightarrow \mu^+$nu are calculated. The trajectories of random rays of cloud particles, which result from a decay within and pass through a specified beam pipe, are traced back to the target plane and plotted. The beam pipe is 1 m long and 20 cm in diameter. There is an elliptical aperture that is 20 cm horizontally and 2 cm vertically. Cloud particles are constrained in angle, less than 100 mrad with respect to the horizontal axis and less than 10 mrad with respect to the vertical axis.

3775 **(LA—9798-P, pp 333-338) Electromagnetic decays of hyperon-excited states.** Hynes, M.V. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Electromagnetic decays have served as bench marks in the developing stages of the shell model in nuclei. The quark confinement pictures for baryons are now in a similar developing stage. This experiment will test in an unambiguous way, the configurations present in the low-lying excited states of the $\Lambda$, $\Sigma$, and XI by measuring the electromagnetic branching ratios that connect them. About half the decays should be measured at Fermilab using the hyperon beam via the Primakoff effect. The remaining transitions, including the very interesting forbidden ones, will require the kaon fluxes and purities available at LAMPF II.

3776 **(LA-UR—83-3067) Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter.** Carruthers, P. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 24p. (CONF-8309168—1). NTIS, PC A02/MF A01. Order Number DE84001726.

From 3. international conference on ultra-relativistic nucleus-nucleus collisions; Upton, NY, USA (26 Sep 1983).

We discuss selected problems concerning the dynamic and stochasticc behavior of highly excited matter, particularly the QCD plasma. For the latter we consider the equation of state, kinetics, quasiparticles, flow properties and possible chaos and turbulence. The promise of phase space distribution functions for covariant transport and kinetic theory is stressed. The possibility and implications of a stochastic bag are spelled out. A simplified space-time model of hadronic collisions is pursued, with applications to A-A collisions and other matters. The domain wall between hadronic and plasma phase is of potential importance: its thickness and relation to surface tension are noticed. Finally we reviewed the recently developed stochastic cell model of multiparticle distributions and KNO scaling. This topic leads to the notion that fractal dimensions are involved in a rather general dynamical context. We speculate that various scaling phenomena are independent of the full dynamical structure, depending only on a general stochastic framework having to do with simple maps and strange attractors. 42 references.

3777 **(SLAC-PUB—3136) Problems at the interface between perturbative and nonperturbative quantum chromodynamics.** Brodsky, S.J.; Bodwin, G.T.; Lepage, G.P. (Stanford Linear Accelerator Center, CA (USA); Argonne National Lab., IL (USA); Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies). Jun 1983. Contract AC03-76SF00515. 27p. (CONF-830368—3). NTIS, PC A03/MF A01. Order Number DE84002375.

From Non-perturbative quantum chromodynamics conference; Stillwater, OK, USA (7 Mar 1983).

Predictions based on perturbative QCD rest on three premises: (1) that hadronic interactions become weak in strength at small invariant separation; (2) that the perturbative expansion in $\alpha$/sub s/(Q) is well-defined; and (3) factorization: all effects of collinear singularities, confinement, nonperturbative interactions, and bound state dynamics can be isolated at large momentum transfer in terms of structure functions, fragmentation functions, or in the case of exclusive processes, distribution amplitudes. The assumption that the perturbative expansion for hard scattering amplitudes converges has certainly not been demonstrated; in addition, there are serious ambiguities concerning the choice of renormalization scheme and scale choice $Q^2$ for the expansion in $\alpha$/sub s/($Q^2$). We will discuss a new

procedure to at least partly rectify the latter problem. In the case of exclusive processes, the factorization of hadronic amplitudes at large momentum transfer in the form of distribution amplitudes convoluted with hard scattering quark-gluon subprocess amplitudes can be demonstrated systematically to all orders in $\alpha$/sub s/($Q^2$). In the case of inclusive reactions, factorization remains an ansatz; general all-orders proofs do not exist because of the complications of soft initial state interactions for hadron-induced processes; thus far factorization has only been verified to two loops beyond lowest order in a regime where the applicability of perturbation theory is in doubt. However, we shall show that a necessary condition for the validity of factorization in inclusive reactions is that the momentum transfer must be large compared to the (rest frame) length of the target. We review the present status of the factorization ansatz. 52 references.

3778 **(SLAC-PUB—3219) Factorization and other novel effects in QCD.** Brodsky, S.J. (Stanford Linear Accelerator Center, CA (USA)). Sep 1983. Contract AC03-76SF00515. 18p. (CONF-8308131—1). NTIS, PC A02/MF A01. Order Number DE84002082.

From 3. international conference on physics in collision; Como, Italy (31 Aug 1983).

Recent progress in proving the validity of factorization for inclusive reactions in QCD is reviewed. A new necessary condition involving the target length is emphasized. We also discuss a number of novel effects in gauge theory including null zone phenomena, color transparency, formation zone conditions, and possible heavy quark Fock states components in ordinary hadrons. 36 references.

3779 **(SLAC-PUB—3249) Quantum chromodynamics in few-nucleon systems.** Brodsky, S.J. (Stanford Linear Accelerator Center, CA (USA); Stanford Univ., CA (USA)). Oct 1983. Contract AC03-76SF00515. 22p. (CONF-830862—10). NTIS, PC A02/MF A01. Order Number DE84002677.

From 10. international conference on few-body problems in physics; Karlsruhe, F.R. Germany (21 Aug 1983).

One of the most important implications of quantum chromodynamics (QCD) is that nuclear systems and forces can be described at a fundamental level. The theory provides natural explanations for the basic features of hadronic physics: the meson and baryon spectra, quark statistics, the structure of the weak and electromagnetic currents of hadrons, the scale-invariance of hadronic interactions at short distances, and evidently, color (i.e., quark and gluon) confinement at large distances. Many different and diverse tests have confirmed the basic predictions of QCD; however, since tests of quark and gluon interactions must be done within the confines of hadrons there have been few truly quantitative checks. Nevertheless, it appears likely that QCD is the fundamental theory of hadronic and nuclear interactions in the same sense that QED gives a precise description of electrodynamic interctions. Topics discussed include exclusive processes in QCD, the deuteron in QCD, reduced nuclear amplitudes, and limitations of traditional nuclear physics. 32 references. (WHK)

3780 **(WIS-PH—82/55) Comparative study of the NN$\pi$ system, II. Elastic NN scattering.** Rinat, A.S.; Bhalerao, R.S. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Nov 1982. 37p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700046.

Using a theory which is unitary in the two and three particle sector, we calculate real and imaginary parts of I = 0, 1 elastic NN phase parameters, and various pp total cross sections. Comparisons are made with results of similar and alternative approaches. Some aspects of the dibaryon issue are discussed.

3781 **(WIS-PH—83/4) Glueballs multiquark states and the OZI rules.** Lipkin, H.J. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Jan 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700051.

New signatures for detection of non-quarkonium mesons are considered, including $K^+K^+\pi^+\pi^-$ and Ksub(s)Ksub(s)$\pi^+\pi^+$ decays for states where $K^+K^+$ and $K^+$Ksup(*)$^+$ decays are forbidden, and A-dependence of Ssup(*) and delta production on nuclei by kaon beams. Analysis of OZI rule shows that only selection rules forbidding hairpin diagrams are valid and that phi phi production by pion beams is not a serious OZI violation indicating presence of glueballs.

3782 **(WIS-PH—83/9) Collective vs atomic models of the hadrons.** Stokar, S. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Feb 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700052.

We examine the relationship between heavy and light quark systems. Using a Bogoliubov-Valatin transformation we show how to interpolate continuously between heavy quark atomic models and light quark collective models of the hadrons.

3783 **(WIS-PH—83/26) Magnetic moments of baryons.** Lipkin, H.J. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Jun 1983. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700049.

The new experimental values of hyperon magnetic moments are compared with sum rules predicted from general quark models. Three difficulties are encountered which are not easily explained by simple models. The isovector contributions of nonstrange quarks to hyperon moments are smaller than the corresponding contribution to nucleon moments, indicating either appreciable configuration mixing present in hyperon wave functions and absent in nucleons or an additional isovector contribution beyond that of valence quarks; e.g. from a pion cloud. The large magnitude of the $>^-$ moment may indicate that the strange quark contribution to the $>$ moments is considerably larger than the value $\mu(\Lambda)$ predicted by simple models which have otherwise been very successful. The set of controversial values from different experiments of the $\Sigma^-$ moment include a value very close to $-(1/2)\mu(\Sigma^+)$ which would indicate that strange quarks do not contribute at all to the $\Sigma$ moments.

3784 **Detailed calculation of the complete two-loop Higgs-Yukawa beta function in an arbitrary $\alpha$ gauge.** Fischler, M.; Oliensis, J. (Department of Physics, University of Pittsburgh, Pittsburgh, Pennsylvania 15260). *Physical Review [Section] D: Particles and Fields;* **28**: No. 8, 2027-2036(15 Oct 1983).

We present a complete calculation of the two-loop contributions to the Higgs-Yukawa beta function, giving the evaluations of individual Feynman diagrams. We calculate in an arbitrary $\alpha$ gauge, and in a range of subtraction schemes that includes minimal subtraction (MS) and modified minimal subtraction (MS). We compute the beta function explicitly for the Weinberg-Salam theory, but our results should be readily adaptable to the computation of the beta function in other theories.

3785 **Extension of the soft-photon theorem for bremsstrahlung.** Bohannon, G.E.; Heller, L. (Carnegie Software, Redondo Beach, California 90278). *Physical Review Letters;* **51**: No. 13, 1151-1154(26 Sep 1983).

A correction to the soft-photon theorem for bremsstrahlung is derived for problems in which the strong interaction is known at large distances. In studies of a model problem the correction generally results in significant improvement in accuracy over the original theorem.

3786 **Time delay and the dyon charge.** Grossman, B. (The Rockefeller University, New York, New York 10021). *Physical Review Letters;* **51**: No. 11, 959-962(12 Sep 1983). Contract AC02-81ER40033.

The scattering of fermions from a magnetic monopole is analyzed in a theory with CP nonconservation. The dyon charge that arises can be understood as a Friedel sum rule from the theory of alloys, as the data for a Riemann-Hilbert problem in the theory of integral equations, and as a consequence of specifying Wigner's R matrix at the monopole core.

3787 **Limits to the number of neutrinos: A comment on the $Z^0$ discovery.** Halzen, F.; Mursula, K. (University of Helsinki, Research Institute for Theoretical Physics, SF-00170 Helsinki 17, Finland). *Physical Review Letters;* **51**: No. 10, 857-858(5 Sep 1983). Contract AC02-76ER00881.

The observation of four Z's in a sample of events containing 32 charged W 's improves terrestrial bounds on the number of neutrinos by roughly one order of magnitude. Also a bound on the production cross section of Z's relative to W 's is obtained. These bounds do not depend on the determination of the Z width.

3788 **Quark mixing matrix in a composite model.** Katsumata, H.; Tomozawa, Y. (Randall Laboratory of Physics, University of Michigan, Ann Arbor, Michigan 48109). *Annals of Physics (New York);* **149**: No. 2, 273-285(Sep 1983).

The generalized mixing matrix of quarks is computed based on a composite model of quarks and leptons. Among potentials between constituent particles examined V(r) = Ar/sup s/ (As>0) and A in r (A>0), it is shown that potentials with exponent 0< or ≈s< or ≈3 or ln r are consistent with current experimental data for the mixing matrix elements.

3789 **Topological soliton bag model for baryons.** Rho, M.; Goldhaber, A.S.; Brown, G.E. (Institute for Theoretical Physics, State University of New York, Stony Brook, New York, 11794). *Physical Review Letters;* **51**: No. 9, 747-750(29 Aug 1983). Contract AC02-76ER13001.

Furnishing Skyrme's chiral soliton with a quark-bag core appears to generate a qualitative advance in the phenomenology of nucleon structure.

3790 **Catalysis of flavor nonconservation by monopoles.** Nair, V.P. (Physics Department, Syracuse University, Syracuse, New York 13210). *Physical Review Letters;* **51**: No. 8, 631-633(22 Aug 1983). Contract AC02-76ER03533.

A simple argument based on current algebra is given to show how monopoles can lead to baryon decay and other flavor-changing processes.

3791 **Family gauge symmetry from a composite model.** Zhou, B.R. (Fermi National Accelerator Lab., Batavia, IL (USA)); Chang, C.H. (New York Univ., NY (USA). Dept. of Physics; Princeton Univ., NJ (USA). Inst. for Advanced Study). *Physics Letters,* [*Section*] *B;* **127**: No. 3/4, 209-214(28 Jul 1983).

A family gauge symmetry SUsup(F)(2) could emerge from a composite model of quarks and leptons under some assumptions of chiral hyperflavor symmetry-breaking pattern. Possible dynamical mechanisms which break the family and electroweak gauge group and produce quark-lepton masses are indicated and their phenomenologies are discussed qualitatively.

3792 **Correlations and fluctuations in hadronic multiplicity distributions: The meaning of KNO scaling.** Carruthers, P.; Shih, C.C. (Los Alamos National Lab., NM (USA). Theoretical Div.). *Physics Letters,* [*Section*] *B;* **127**: No. 3/4, 242-250(28 Jul 1983).

Charged hadronic multiplicity distributions at Fermilab, ISR and collider energies are shown to be described by generalized Bose-Einstein distributions of the type encountered in quantum optics. Systematic energy-dependent deviations from KNO scaling are well described by simple cases of this formula, which in the limit of large anti n have a simple and explicit scaling form, valid to a few percent at the CERN collider energy. It is suggested that this framework is generic, i.e., practically independent of dynamical details. The essential feature is that the field variables of the 'radiant surface' for hadronic emission are distributed as gaussian random variables (with k effective sources) as suggested by a typical central limit theorem argument. In order to bring the lower energy data into a form easily comparable with higher energy data, particularly for the crucial large multiplicity events (n/anti n) >> 1, it is essential to remove the two charges of the 'leading' particles from the counting rules. The long tail of the KNO distribution is to be identified with coherent fluctuations analogous to those occurring in the Hanbury-Brown-Twiss effect.

3793 **Hypernuclear spectroscopy in the p shell.** Auerbach, E.H.; Baltz, A.J.; Dover, C.B.; Gal, A.; Kahana, S.H.; Ludeking, L.; Millener, D.J. (Brookhaven National Laboratory, Upton, New York 11973). *Annals of Physics (New York);* **148**: No. 2, 381-435(Jul 1983). Contract AC02-76CH00016.

A comprehensive shell-model approach to Λ-hypernuclear spectroscopy in the p shell is developed. The available data on the spectra of $^{9}$/sub Λ/Be, $^{13}$/sub Λ/C, $^{13}$/sub Λ/C, $^{14}$/sub Λ/N, and $^{16}$/sub Λ/O are interpreted in this framework, leading to constraints on the residual ΛN interaction and the one-body Λ-nucleus potential. The mechanism for the formation of Λ hypernuclei via the $(K^-, \pi^-)$ reaction is treated in the relativistic distorted wave approximation, with careful attention paid to Fermi-averaging of the elementary $K^- n \rightarrow \pi^- \Lambda$ amplitude and recoil corrections. Departures from the simple weak coupling picture, arising from configuration mixing, are emphasized. This leads to approximate dynamical symmetries in hypernuclei which are forbidden in orbinary nuclei by the Pauli principle. Further experiments in the p shell are suggested which may reveal other aspects of ΛN interactions.

3794 **Quark mixing in weak interactions.** Chau, L.L. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.). *Physics Reports: A Review Section of Physics Letters (Section C);* **95**: No. 1, 3-94(Apr 1983).

The status of the quark mixing in weak interaction is reviewed. The 3 x 3 quark mixing matrix for the three left-handed doublet model is analyzed using various experimental information involving strange, charmed, and b-flavored particles. Its interplay with nonleptonic decays, implication on neutral particle-antiparticle mixing and CP violation in heavy quark systems, and the possible origin of the quark mixing from quark mass matrix are discussed. Finally we briefly review the status of alternative sources for CP violation, and alternative models to the three left-hand quark doublet model.

## 6453 Particle Invariance Principles And Symmetries

*REFER ALSO TO CITATION(S) 3680, 3682, 3683, 3684, 3704, 3824, 3830, 3831, 3848*

3795 **(EFI—517(4)-82) Discrete symmetries in SO(N) grand unified groups and the survival hypothesis.** Asatryan, H.M. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703969.

The possibility of introducing the discrete symmetry D is studied which along with SUsup(c)(3)xSUsub(L)(2)xU(1) symmetry remains after the breaking of the SO(N) grand unified symmetry group by the Higgs fields vacuum with expectation values on of the order $10^{15}$ GeV. The quantum number corresponding to this symmetry distinguishes the fermions coupled with W-bosons via left and right currents. As a result the presence of low-mass fermions in the thoery is provided.

3796 **(IC—80/18) Neutral current weak interaction without electroweak unification.** Riazuddin. (International Centre for Theoretical Physics, Trieste (Italy)). Feb 1980. 13p. NTIS (US Sales Only), PC .A02/MF A01. Order Number DE83704008.

It is shown that it is possible to obtain the neutral current weak interaction as the third component of the SU(2) group without electroweak unification, provided that fundamental doublets contain in general a mixture of left-handed and right-handed fields. The main experimental consequence is the relation msub(W)sub(3)approx.=√2 msub(W), with the further possibility that msub(W) could be lower than that predicted by the standard model.

3797 **(IC—80/54) Eight-fold way to colour geometrodynamics.** Mielke, E.W. (International Centre for Theoretical Physics, Trieste (Italy)). May 1980. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704014.

Colour models of strong interactions are generalized to a GL(8,C)sup(f) x GL(8,C)sup(c) gauge theory incorporating space-time curvature and Cartan's torsion. Following Salam, the dynamics is determined by an Einstein-Dirac-type Lagrangian. The resulting field equations are a nonlinear (due to the torsion) Heisenberg-Pauli-Weyl equation for the fundamental spinor fields and a generalized Einstein equation for the background metric of hadronic dimensions. According to this model, baryonic quarks are confined in geon (black soliton)-type objects by the tensor gluons of strong gravity. This approach also leads to a black soliton mass formula which is in qualitative agreement with part of the baryon spectrum. Hadronic mesons are interpreted as gluon strings trapped in a multiconnected spacetime. Interrelations of color geometrodynamics with other "bag" models are pointed out. Finally, the conceptual origin of this space-time foundation of quark confinement is presented.

3798 **(IC—80/72) Quark-lepton unification and proton decay.** Pati, J.C.; Salam, A. (International Centre for Theoretical Physics, Trieste (Italy)). May 1980. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704016.

Complexions for proton decay arising within a maximal symmetry for quark-lepton unification, which leads to spontaneous rather than intrinsic violations of B, L and F are considered. Four major modes satisfying $\Delta B=-1$ and $\Delta F=0$, -2, -4 and -6 are noted. It is stressed that some of these modes can coexist in accord with allowed solutions for renormalization group equations for coupling constants for a class of unifying symmetries. None of these remarks is dependent on the nature of quark charges. It is noted that if quarks and leptons are made of constituent preons, the preon binding is likely to be magnetic.

3799 **(IC—80/94) Witten's charge formula.** Salam, A.; Strathdee, J. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1980. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704019.

Witten's formula for the dyon charge in the presence of a CP violating surface term is derived by a canonical argument.

3800 **(IC—80/116) Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons.** Socolovsky, M. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1980. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704006.

We find that the predictions for spin-spin asymmetries in $\nu$ and $\nu$-bar-nucleon deep inelastic scattering of various models for spin distributions are very different. We argue that a measurement of these asymmetries would be a sensible test for the different models.

3801 **(IC—80/125) Generation of baryon excess in SU/sub L/$_2$ x SU/sub R/$_2$ x SU/sub c/$_4$.** Deo, B.B.; Prasad, V.B. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1980. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704007.

We have calculated the magnitude of the cosmological baryon asymmetry in a gauge theory based on the group SUsub(L)(2) x SUsub(R)(2) x SUsub(c)(4) and find that plausible parameters exist in the model to explain the baryon excess with a subunifying mass scale of $10^4$-$10^5$ GeV. The novel idea used is that the vacuum eats away antimatter through the VEV of the Higgs meson.

3802 **(IC—81/154) Tests for complete breakdown of discrete symmetry in D neutral-anti D neutral.** Chela-Flores, J. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1981. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704020.

Implications of the conservation of probability without assuming CPT invariance, but allowing for the existence of a direct superweak ($\Delta C=2$) interaction are studied for the charmed system D neutral-anti D neutral. We find that the values of the decay widths of the particles with definite mass lead to considerable simplifications in the phenomenological description of this neutral system. These simplifications do not occur in the K neutral-anti K neutral system. In particular, we obtain the expressions for the particle number per unit time, at time tau measured in the D neutral meson rest frame, arising from an initially pure beam of D neutral-mesons. By considering the anomalous part of the particle number expression, we find means of distinguishing between the various forms of discrete symmetry breakdown.

3803 **(IC—82/15) SO(14) unification of 3+1 families.** Karadayi, H.R. (International Centre for Theoretical Physics, Trieste (Italy)). Mar 1982. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704027.

It is shown that the unification of 3+1 families is possible within the framework of 64 dimensional spinor representation of SO(14). Special care is given for a description without the heavy excess fermions such as conjugate and mirror or completely exotic fermions of some family unification schemes. With the aid of an intrinsic "L-R Asymmetry" mechanism which we proposed recently, the conventional strong and electromagnetic interactions are obtained for all four families by concentrating only on the symmetry breaking SO(14) → SU(3)sub(c) x U(1)sub(e.m.). However, the conventional weak interactions of the first three families are obtained just as in the standard SU(2)sub(L) x U(1)sub(Y) model, while those of the prescribed fourth family show certain differences. This is what we mean by 3+1 family unification. All vector particles mediating strong, electromagnetic and weak interactions which are the subjects of present phenomenological tests are specified among the vector fields of SO(14) and their mass mechanisms leading to a consistent description of this low-energy phenomenology are studied with the aid of the Higgs multiplets 14, 364, 1716 and 2002 of SO(14). Moreover, the fermion mass mechanisms are considered with the aid of these scalar multiplets and the contributions from these scalars to the vector and fermion masses are explicitly calculated. All these calculations are carried out in the new mathematical technique for the Lie algebra representations which we introduced recently.

3804 **(IC—82/89) Spontaneous breaking of global B-L symmetry and matter-antimatter oscillations in grand unified theories.** Mohapatra, R.N.; Senjanovic, G. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1982. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704033.

We explore the consequences of the hypothesis that B-L symmetry, which is exact in the standard model based on SU(2)sub(L) x U(1) x SU(3)sub(c) gauge group and its extension to the minimal SU(5) theory, is a spontaneously broken global symmetry. This results in possibly observable rates for $\Delta(B-L)=0$, $\Delta B=2$ hydrogen-antihydrogen transitions and double proton decay $pp\to e^+e^+$ ($\mu^+\mu^+$) and $\Delta(B-L)\text{not}=0$, $\Delta B=2$ neutron-antineutron mixing and $p+n\to\pi$'s, and furthermore, a relation between the transition time tausub(H-H-bar), tausub(n-n-bar), Majorana neutrino mass and a mass of a doubly charged Higgs particle $\Delta^{++}$ emerges. At the level of SU(2)sub(L) x U(1) x SU(3)sub(c), for tausub(n-n-bar)approx.$=10^7$ sec and msub($\Delta$)$^{++}$approx.$=20$ GeV, we predict tausub(H-H-bar)approx.$=10^3$ yr and tausub(pp)approx.$=10^{31}$ yr, both of which are experimentally stable numbers. The embedding of our model in SU(5) is discussed in detail, with the analysis of tausub(p) and sin$^2$thetasub(W) besides matter oscillations.

3805 **(IC—82/92) Anomaly extraction from the path integral.** Christos, G.A. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1982. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704035.

Fujikawa's recently proposed derivation of the anomaly from the path integral is examined. It is attempted to give a better understanding of his work. In particular, evasions of his result are discussed; for example it is shown how chiral U(1) axial invariance can be maintained by employing a gauge variant regularization prescription. A brief connection with the point-splitting method is also made.

3806 **(IC—82/111) SU(N)-QCD$_2$ meson equation in next-to-leading order.** Durgut, M.; Pak, N.K. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704022.

We compute the 1/N corrections to the meson equation in the regular cut-off scheme. We illustrate that although the quark and gluon self energy and vertex corrections do not vanish explicitly as in the singular cut-off scheme, their contributions to the meson Bethe-Salpeter equation get cancelled within the whole set of contributing diagrams. We also argue that 0(1/N) corrections to the meson equation remove the massless boson from the spectrum in accordance with the Coleman theorem.

3807 **(IC—82/117) Approach to gauge hierarchy in the minimal SU(5) model of grand unification.** Ghose, P. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704023.

It is shown that if all mass generation through spontaneous symmetry breaking is predominantly caused by scalar loops in the minimal SU(5) model of grand unification, it is possible to have an arbitrarily large gauge hierarchy msub(x) >> msub(w) with all Higgs bosons superheavy. No fine tuning is necessary in every order.

3808 **(IC—82/118) Scalar loops and the Higgs mass in the Salam-Weinberg-Glashow model.** Ghose, P. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704024.

It is shown that spontaneous symmetry breaking is predominantly driven by scalar loops in the standard Salam-Weinberg-Glashow model if lambda approx.=0(e$^2$). The Higgs mass is predicted to be 0(64 GeV), which is considerably higher than the Coleman Weinberg prediction.

3809 **(IC—82/141) Quark mixing angles in the left-right symmetric model with light W/sub R/ from K$^0$-K$^0$ mixing.** Raychaudhuri, A. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704025.

K/sub L/-K/sub S/ mass difference and the CP violation parameter, epsilon, of the K$^0$-K$^0$ system are used to set bounds on the right-handed Cabibbo-like angle and the CP violating phase angle in the left-right symmetric electroweak model of four quarks. The corresponding mixing and phase angles in typical left-right asymmetric models (g/sub L/not=g/sub R/) are also determined.

3810 **(IC—82/157) Does nature like Nambu-Goldstone bosons.** Gelmini, G.B.; Nussinov, S.; Yanagida, T. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704029.

We argue here that many (up to around 30 species) so far undetected Goldstone bosons could exist in nature, for example, associated to the spontaneous breaking of a horizontal global symmetry, provided the breaking scale is V >or approx. 10$^{10}$ GeV. Since Goldstone bosons do not generate $r^{-1}$ but spin-dependent $r^{-3}$ nonrelativistic long-range potentials, the apparently most dramatic effect of massless bosons - new long-range forces competing with gravitation and electromagnetism - is easily avoidable (the Glashow-Weinberg-Salam breaking scale is enough). $\mu \to eG$ and $K \to \pi G$ provide the most restrictive bounds and probably the only possibility to look for Goldstone bosons in laboratory.

3811 **(IC—82/222) Order $\alpha$Gsub($\mu$) corrections to the parity-violating electron-quark potential in the Weinberg-Salam theory: parity-violations in one-electron atoms.** Lynn, B.W. (International Centre for Theoretical Physics, Trieste (Italy)). [nd]. 39p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704030.

Paper copy only, copy does not permit microfiche production0 refs.

We have calculated the order $\alpha$Gsub($\mu$) corrections to the order Gsub($\mu$) parity-violating (PV) electron-quark potential Hsub(PV)sup(e-q) at $q^2=0$ in the standard SU(2)sub(L) x U(1) theory using a renormalization scheme which has Msub(W), Msub(Z) and Msub(H) (Higgs' mass) as input parameters. We then use SU(3) relations to write an effective PV electron-nucleon potential Hsub(PV)sup(e-N) in terms of the dimensionless parameters Csub(1P), Csub(1N) (nuclear spin independent) Csub(2P), Csub(2N) (nuclear spin dependent) and Csub(3P), Csub(3N) (electron anomalous magnetic moment dependent). For ssub(theta)$^2$ identical to 1-Msub(W)$^2$/Msub(Z)$^2$ approx.= .23 and small Higgs' mass Msub(H)<or approx.Msub(W), the corrections to Csub(1P) are negligible while those to Csub(1N), Csub(2N) are quite large with corrections to Csub(2P) of medium importance. The Msub(H)-dependent corrections to these four parameters are all large for large Msub(H)>or approx.1 TeV. Csub(3P), and Csub(3N) are first induced at one loop and are small. We show that Csub(2P) and Csub(2N) suffer from large uncertainties due to the strong interactions which make the theoretical interpretation of experiments designed to measure these quantities less clear than was previously thought. The other parameters are relatively free from strong interaction uncertainties. We review the diseases of the old 1934 four-fermion theory and give an overview of the renormalization of the Weinberg-Salam theory. We discuss the possibility of high-precision experiments in one-electron atoms to measure these radiative corrections and remind the reader of a previously proposed experiment in hydrogen or deuterium which will measure Csub(1P) or Csub(1P)+Csub(1N) respectively.

3812 **(IFVE-OTF—82-37) One method to calculate of color factors of Feynman diagrams.** Khrushchev, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704039.

A method to calculate color factors associated with Feynman diagrams in SU(N) gauge theory is considered. The correspondence between the permutations isub(l),....., isub(n) of the indices l,..., n and diagrams from the set, which is the color basis for the fermion-fermion (qq) or fermion-antifermion (q anti q) interactions has been established. The formula for color factors of the diagrams, which correspond to the permutation isub(l),....., isub(n) is obtained. The color factors of some series of the vacuum q anti q-diagrams are calculated.

3813 **(IFVE-OTF—82-190) Properties of scalar constituents of hadrons with respect to SU(2)sub(L)xU(1) group.** Khrushchov, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704037.

A classification and possible mixing parameters for hadron scalar constituents qsub(i)sup(B), 1=1,..., 6 with the electric charge distribution Q+1, Q, Q, Q, Q, Q-1 have been found with respect to the group of electroweak interactions. It is suggested that direct neutral weak current is diagonal in the qsub(i)sup(B) flavour basis. Possible physical applications of the hadronic model, containing both spinor and scalar constituents are discussed.

3814 (INIS-mf—8157, pp 58-61) **Nondiagonal Z-decay - Z→anti e+$\mu$.** Mann, G. (Humboldt-Universitaet, Berlin (German Democratic Republic). Sektion Physik); Riemann, T. (Akademie der Wissenschaften der DDR, Berlin-Zeuthen. Inst. fuer Hochenergiephysik). 1982. NTIS (US Sales Only), PC A15/MF A01. (CONF-820675—Vol.2).

From International conference on neutrino physics; Balaton, Hungary (14 Jun 1982).

The decay of the Z boson postulated by Weinberg-Salam theory of electromagnetic and weak interactions is calculated using the nondiagonal Kobayashi-Maskawa neutrino mass matrix. The branching ratio of the decay of Z boson into positron and muon is calculated in one-loop approximation assuming very small and mediate neutrino masses. The related problem of lepton number nonconservation is investigated.

3815 (INIS-SU—180, pp 26-35) **Nonlocal quark model.** Efimov, G.V.; Ivanov, M.A. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

A nonlocal quark model (NQM) is considered which describes the low-energy hadron physics and explains the problem of the quark and gluon confinement and the absence of colored hadron states. The model is based on a new quantized field - the virtonfield. The NQM implies the following: 1) hadrons are considered to follow the SU(3) group systematics, to have experimentally observed masses, and to be described by standard quantized fields; 12) quarks in the SU(3)xSUsub(c)(3) group are described by quantized quark-virton fields; 3) hadrons are supposed to be capable of interacting with each other not directly, but by the way of quark exchange; 4) hadrons are supposed to be the bound states of quarks; 5) the integrals corresponding to any Feynman diagrams are in good agreement; 6) weak and electromagnetic interactions of hadrons, quarks and leptons are introduced by Lagrangians invariant relative to the SU(3)xSUsub(c)(3)xU(1) group. In the framework of NQM a series of decay of pseudoscalar and vector mesons of the baryon octet and decuplet. All basic electromagnetic decays of eta-eta' mesons are calculated and the data are tabulated. The data characterizing the hadron structure are of greatest interest for the model. The authors are of opinion that NQM is quite capable of describing the low-energy hadron physics.

3816 (INIS-SU—180, pp 98-107) **T quark mass in the SO-(10) symmetry.** Asatryan, G.M.; Matinyan, S.G. (Erevanskij Fizicheskij Inst. (USSR)). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The mass ratios for fermions are studied on the base of the unifying SO(10) group on the assumption that fermions obtain the mass at the expense of the Higgs average vacuum fields that are included in representations 10 and 126. The t-quark mass values are estimated to be msub(t) $<$ 22.6 GeV and msub(t) $<$ 29.3 GeV depending ion the QCD parameter $\Lambda$=0.08 GeV and $\Lambda$=0.34 GeV. A conclusion may be drawn that the t-quark mass in the SO(10) symmetry might exceed 15 GeV in difference with the earlier estimates. The neutrino mass at this may be equal to zero in the three-graph approximation.

3817 (INIS-SU—180, pp 107-112) **Practically stable proton in the SU-5 model.** Berezinskij, V.S.; Smirnov, A.Yu. 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

Permutations and mixing of the fermion right comonents from different generations, in the $SU_5$-model with an additional Higgs 45-let, could lead to substantial changes of both the proton lifetime and the relationships between the probabilities of proton decay different channels. In the presence of solely three known fermion generations the upper limit of the proton lifetime, tausub(p)sup(max) approximately equal to $10^{34}$ to $10^{37}$ years, is defined by the Kobayashi-Maskava angles and their experimental errors. At this the dominant channel is a difficulty detectable $p \rightarrow \nu X$ channel. The ultimate versions of mixing correspond to the longest proton lifetime and suppression of readily detectable decay modes. In view of principal difficulties of revealing the proton instability with tausub(p) $>$ or approximately $10^{34}$ years, the lifetimes for the ultimate versions imply a practically stable proton. By varying the mixing angles one could obtain an arbitrary proton lifetime between the prediction of both the standard $SU_5$ model and ultimate versions. All conclusions drawn to apply to the neutron decay with the baryonic number violation as well.

3818 (INIS-SU—180, pp 128-132) **P-odd nuclear forces are a source of parity violation in atom.** Flambaum, V.V.; Khriplovich, I.B. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The effects of parity nonconservation in atoms are stated to be specified not only by neutral currents. They may also be induced by the P-odd nuclear forces. The spatial parity violation in a nucleus results in the appearance of spiral spin structure and toroidal currents. It is the resulting contribution to the nuclear vector-potential that leads to the P-odd interaction of an electron with a nucleus. A detailed consideration is given to the deuton anapole momentum. The experimental possibility is indicated to measure anapole momenta of various nuclei by way of studying the optical activity of gas of binary molecules.

3819 (LA—9798-P, pp 266-273) **CP violation.** Herczeg, P.; Hoffman, C.M. (comps.). (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The phenomenon of CP violation was discovered in 1964 when it was observed that the long-lived neutral kaon (K/sub L) decayed into two charged pions, a decay mode forbidden by CP symmetry. In the last 18 years, considerable time and effort have been expended to study and explain this phenomenon. The origin of CP violation is still unknown. However, the success of gauge theories has stimulated investigations that have led to better understanding of possible sources of CP violation in the fundamental interactions. The present experimental status is that CP violation has been observed only in the neutral kaon system and this violation is consistent with being due to a nonzero CP-violating imaginary off-diagonal term in the mass matrix that couples $K^0$ and anti $K^0$. A variety of theoretical models is consistent with this picture. To understand what interaction is responsible for CP violation is of crucial importance. As is discussed, the key to this understanding will be a series of high-precision experiments. LAMPF II is ideally suited to these experiments. 37 references.

3820 (TRI-PP—83-64) **Symmetries and the N-N interaction.** van Oers, W.T.H. (Manitoba Univ., Winnipeg (Canada); British Columbia Univ., Vancouver (Canada). TRIUMF Facility). Aug 1983. 13p. (CONF-830862—9). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84900201.

From 10. international conference on few-body problems in physics; Karlsruhe, F.R. Germany (21 Aug 1983).

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A new generation of precision experiments to symmetries in the N-N system is being undertaken at various laboratories. A short discussion of the background to some of these experiments is presented. 29 references.

3821 **Supersymmetry breaking by instantons.** Affleck, I.; Dine, M.; Seiberg, N. (Joseph Henry Laboratories, Princeton University, Princeton, New Jersey 08544). *Physical Review Letters;* **51**: No. 12, 1026-1029(19 Sep 1983). Contract AC02-76ER02220.

It is shown that instantons generate a superpotential in supersymmetric QCD with N colors and N-1 flavors.

3822 **Baryons as chiral solitons.** Jackson, A.D.; Rho, M. (Department of Physics, State University of New York, Stony Brook, New York 11794). *Physical Review Letters;* **51**: No. 9, 751-754(29 Aug 1983). Contract AC02-76ER13001.

Topologically stable solitonic solutions to Skyrme's chiral-invariant Lagrangian have been obtained numerically. The single parameter in these solutions has been determined with the Goldberger-Treiman relation. The identification of these objects with baryons leads to sensible statements regarding the sizes and energies of baryons as well as the two- and three-body interactions between baryons at zero separation.

3823 **Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics.** Scadron, M.D. (Department of Physics, University of Arizona, Tucson, Arizona 85721). *Annals of Physics (New York);* **148**: No. 2, 257-281(Jul 1983). Contract AC02-80ER10663.

The dynamical theory of spontaneous breakdown correctly predicts the bound states and relates the order parameters of electron—phonon superconductivity and quark—gluon chiral symmetry. A similar statement cannot be made for the standard electroweak gauge symmetry.

## 6454 Field Theory

*REFER ALSO TO CITATION(S) 3720, 3742, 3758, 3772, 3778, 3784, 3797, 3801, 3815, 3816, 3817*

3824 **(CEA-CONF—6637) Lattice gauge theories with Susskind fermions at strong coupling. Analytical method and results.** Morel, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Dec 1982. 19p. (CONF-821253—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703967.

From Topical meeting on progress in the solution of quantum gauge theories; Trieste, Italy (17 Dec 1982).

We expose a method for dealing with Susskind fermions in lattice gauge theories. The Green's functions for composite mesons and baryons can be systematically computed as series expansions in the inverse dimension and inverse bare coupling constant. Spontaneous breaking of the remnant part of chiral symmetry is shown to occur. The corresponding $\pi$-like Goldstone boson is exhibited, and the low-lying meson and baryon masses evaluated. A semi-quantitative agreement with numerical estimates by Monte-Carlo simulations is found.

3825 **(CEA-CONF—6639) Complex singularities and distribution of zeros in Ising and gauge models.** Zuber, J.B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)), Jan 1983. 15p. (CONF-821253—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703968.

From Topical meeting on progress in the solution of quantum gauge theories; Trieste, Italy (17 Dec 1982).

This talk reports on a study of properties of lattice gauge theories for complex values of the coupling, namely of possible singularities and distribution of zeros of their partition function.

3826 **(CEA-N—2329) Introduction to Feynman graph calculations.** Picard, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Mar 1983. 79p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE84700039.

An introduction to Feynman graph calculations is presented through 6 examples treated in extenso at the first order of perturbation theory. It recalls the necessary formulas of quantum field theory, matrix element calculation and graph representation for the first developped S matrix terms. Next follow the detailed calculations for: 1) $\mu^-$ decay; 2) $e^-$,p scattering; 3) Compton scattering; 4) $\pi^+$ photoproduction on proton; 5) Bremsstrahlung; and 6) $\pi^0$ decay. Units and conventions, relativistic mechanics and relativistic kinematics of nuclear reactions are recalled in appendices.

3827 **(DOE/ER/03992—526) Prospects for further unification.** Ne'eman, Y. (Tel Aviv Univ. (Israel); Institute for Advanced Study, Princeton, NJ (USA)). Jul 1983. Contract AS05-76ER03992. 26p. NTIS, PC A03/MF A01. Order Number DE84002842.

Portions are illegible in microfiche products.

We review the unification of weak and electromagnetic interactions (QAD), the prevalent color gauge theory of the strong interactions (QCD) and attempts to embed both these theories in a further Unified Gauge Theory. We discuss the related advances in cosmology and touch upon other approaches to the understanding of particles and fields. 44 references.

3828 **(IC—80/123) New solution for the Schwinger model.** Baaquie, B.E. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1980. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703973.

We solve the Schwinger model exactly using the path integral. The fermion sector is solved using the axial current anomaly. We then study the Wilson loop integral for the interacting theory, and discuss the Wilson criterion for confinement.

3829 **(IC—82/93) Supergroup extensions: from central charges to quantization through relativistic wave equations.** Aldaya, V.; Azcarraga, J.A. de. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1982. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703975.

We give in this paper the finite group law of a family of supergroups including the U(1)-extended N=2 super-Poincare group. From this family of supergroups, and by means of a canonical procedure, we are able to derive the Klein-Gordon and Dirac equations for the fields contained in the superfield. In the process, the physical content of the central charge as the mass parameter and the role of covariant derivatives are shown to come out canonically from the group structure, and the U(1)-extended supersymmetry is seen as necessary for the geometric quantization of the relativistic elementary systems.

3830 **(IC—82/108) Necessity of intermediate mass scales in grand unified theories with spontaneously broken CP invariance.** Senjanovic, G. (International Centre for Theoretical Physics, Trieste (Italy)). Jul 1982. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704021.

It is demonstrated that the spontaneous breakdown of CP invariance in grand unified theories requires the presence of intermediate mass scales. The simplest realization is provided by weakly broken left-right symmetry in the context of SU(2)sub(L) x SU(2)sub(R) x U(1)sub(B-L) model embedded in grand unified theories.

3831 **(IC—82/153) Relation mr << 1 in the preon model.** Xinzhou, L.; Jianzu, Z.; Kelin, W. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704028.

We use the result of the monopole in the SU(2) gauge theory, the isospin degrees of freedom converted into spin, to show a mechanism which can give the condition msub(q,l)rsub(q,l) << 1 in the composite model of quarks and leptons. In this paper, we have suggested a preon model with flavons fsub(i), chromons Csub($\alpha$) and somons ssub(k), in which the SUsub(H)(2) x Usub(A)(1) x Usub(B)(1) binding forces are broken spontaneously by a triplet of Higgs fields. The SUsub(M)(2) give a nonabelian monopole background field and Usub(A)(1) x Usub(B)(1) are interpreted as arising from hidden electric and magnetic type charges.

3832 **(IC—82/194) Surface terms and dual formulations of gauge theories.** Mecklenburg, W.; Mizrachi, L. (International Centre for Theoretical Physics, Trieste (Italy)). Sep 1982. 25p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703974.

Previously proposed duality transformations for a pure non-Abelian gauge theory are carried out for a Yang Mills theory with non-vanishing theta parameter. We argue that the theory is no longer self-dual even in the weak coupling limit, as there is a surface term generated by the duality transformation. This surface term has non-zero Pontryagin index hence it gets contributions from instanton type configurations only. However, it does vanish for monopoles and vortices, therefore, for this set of configurations, self-duality is maintained in the weak coupling region.

3833 **(IFT-P—06/81) Gauge hierarchy problem.** Natale, A.A.; Shellard, R.C. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1981. 16p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704377.

The problem of gauge hierarchy in Grand Unified Theories using a toy model with O(N) symmetry is discussed. It is shown that there is no escape to the unnatural adjustment of coupling constants, made only after the computation of several orders in perturbation theory is performed. The propositions of some authors on ways to overcome the gauge hierarchy problem are commented.

3834 **(IFVE-OTF—82-169) Quantum theory of two-dimensional generalized Toda lattice on bounded spatial interval.** Leznov, A.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703979.

The quantization method of exactly solvable dynamical systems worked out in another paper is applied to a two-dimensional model described by the equations of generalized Toda lattice with a periodicity condition over spatial variable. The Heisenberg operators of the model are finite polynomials over the coupling constant $g^2$, whose coefficients functionally depend on operators of noninteracting fields. The model has a direct relation with the string theories and reduces formally when L→infinity to two-dimensional quantum field theory described by the equations of generalized Toda lattice the formal solution of which has been found in Refs.

3835 **(INIS-BR—84) Introduction to lattice gauge theories.** Alcaraz, F.C. (Sao Carlos Univ. (Brazil). Dept. de Fisica). 1981. 47p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704380.

Lattice gauge theory with Z(2) symmetry (Ising model) is studied. Some aspects of this theory are also studied for the case with Z(N) symmetry.

3836 (INIS-SU—180, pp 19-26) **Present state of quantum electrodynamics.** Faustov, R.N. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Fiziko-Tekhnicheskikh i Radiotekhnicheskikh Izmerenij, Moscow (USSR)). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

Questions of a consecutive check of QED in the region of low and high energies are discussed as well as conditions for a better accuracy of the hyperfine structure constant, $\alpha$. To check QED in the low energy region, considered are: the electron- and muon anomalous magnetic moments; the spectra of hydrogen-like atoms- the hyperfine structure of muonium, positronium and muonic helium $(\mu^4He)^+$, and also the Lamb shift in hydrogen. Comparative evaluations of available experimental and theoretical data are made. Corrections are suggested to obtain a better aggreement between the experimental and theoretical evaluations. It is noticed that the introduction of a new PETRA accelerator with colliding electron-positron beams has widened the possibilities of checking the QED validity at high energies. The lower limits for the Asup(+-) parameters (in GeV), for the reactions $e^+e^- \to e^+e^-$, $e^+e^- \to \mu^+\mu^-$, $e^+e^- \to \gamma\gamma$, $e^+e^- \to tau^+tau^-$, obtained by different research groups are given in the table. The experiments, beside checking QED, confirm the properties of e, $\mu$, tau charged leptons to be universal, and in particular, the tau-lepton to be point-like.

3837 (INIS-SU—180, pp 80-98) **Grand unified asymptotic-free model.** Fradkin, E.S. (AN SSSR, Moscow. Fizicheskij Inst.). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The SU(5) and $E_6$ asymptotic-free models are described. The first model is the most simple and economic model of the grand unification (GUM). The second model possesses a remarkable property: all fermions (and equally bosons) are in the same fundamental representation. The GUMs are constructed on the so-called "unstable" solutions of the renormalization-group equations. The differences between the SU(5) GUM model and the SU(5) model, proposed in 1974 by Geordge and Glashow, are shown. The most important of them are: a) the presence of the neutrino mass; b) the absence of other light neutrinos, except for $\nu$sub(e) and $\nu$sub($\mu$); c) the lifetime of the tau-lepton in the SU(5) GUM is by an order higher than that in the SU(5) standard model; d) the occurrence of a number of decay and production processes, but with the small probability; e) the potentiality to obtain atomic experimental results different from the Weinberg-Salam model and also an agreement of the results with the data of SLAC. A distinguishing feature of the $E_6$ GUM is the fact that its effective charges differ in the magnitude order from the effective charges in other models. Therefore, the effect of a spontaneous symmetry breaking on the effective charge at $10^{15}$ GeV is discussed and radiative corrections to the Green functions as well. The author is of the opinion that the SU(5) GUM describes all interactions in the low-energy range physically truly.

3838 **(ITEF—166(1982)) Stability regions of one-dimensional solitons of a charged scalar field.** Belova, T.I.; Voronov, N.A.; Konyukhova, N.B.; Parijskij, B.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700005.

Numerical investigations into the stability of soliton solutions of the phi(x, t)=phi(x)esup(-i$\omega$t) type for the nonlinear equation of $d^2phi/dx^2-\sigma^2phi/dt^2=K^2phi-\mu^2{}'phi'^2phi+lambda'phi'^4phi$ in the two-dimensional space-time are given. Areas of parameter values, where these solutions are stable relative to small perturbations in the linear theory approximation have been determined.

3839 **(ITEP—96(1982)) Pionino: an argument against massless gluino.** Eides, M.I.; Vysotsky, M.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 5p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700041.

Spontaneous R-invariance breaking in a low energy SUSY (supersymmetry) theory inevitably leads to an extra light pseudoscalar boson (pionino). As this possibility is experimentally excluded the R-invariance has to be broken explicity, for example by lagrangian gluino Majorana mass term.

3840 **(WIS-PH—82/42) Do 't Hooft anomaly equations know about Georgi-Glashow grand unification.** Davidson, A.; Sonnenschein, J. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Sep 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700006.

We examine the embedding of SU(k)sub(HC) composite schemes within flavor-chiral color-asymptotically-free SU(N) grand unifying theories. It is shown that unless k = 3, the associated spector-composite structure conspires to be real under the residual gauge interactions. The exceptional n-preon SU(3)sub(HC) scheme is capable of supporting a non-exotic quark/lepton spectrum only if n = 4,5. The SU(8) embeddable n = 5 case leads to a multigenerational Georgi-Glashow SU(5) picture.

3841 **(WIS-PH—82/58) Complex Rishon-type unification.** Davidson, A.; Sonnenschein, J. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Dec 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700047.

We present a flavor-chiral version of the Rishon model. The troublesome $\alpha$sub(C)→0 't Hooft limit is satisfied in a non-exotic manner. The scheme is SU(7) grand unified. Its uniqueness stems from the fact that a realistic SU(n)sub(HC) scenario is SU(N) embeddable only provided n = 3, with 4 (or 5) preons involved. A total number of three quark/lepton families is dictated by the overall renormalizability. The electric charge serves as the fourth-color.

3842 **(WIS-PH—82/60) Composite model for quarks and leptons.** Harari, H. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Dec 1982. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700048.

We discuss the motivation for constructing composite models for quarks and leptons, the hopes we have for a successful model and the difficulties encountered, so far, in this field. This paper corresponds to the contents of lectures given at the SLAC Summer Institute (August 1982), at the DESY Workshop on "Electroweak Interactions at High Energies" (September 1982) and at the Solvay Conference at the University of Texas, Austin, Texas (November 1982).

3843 **(WIS-PH—83/3) Surface description of QCD with fermionic quark boundaries.** Burden, C.J. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics). Jan 1983. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700050.

The flux sheet description of pure gauge theories proposed by Bardakci and Greensite is extended to include fermionic quark fields defined on the sheet boundaries. The quark fields are sources and sinks of colour flux and the action remains gauge invariant. It is shown that the partition function contains colour singlet contributions with the quantum numbers of mesons, baryons and exotics.

3844 **(WIS-PH—83/19) N = 2 two dimensional Wess-Zumino model on the lattice.** Elitzur, S.; Schwimmer, A. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics). Apr 1983. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700007.

A lattice version of the N = 2 SUSY two dimensional Wess-Zumino model was constructed and studied. The correct continuum limit is checked in perturbation theory. The strong coupling limit is defined and investigated. We find that the ground state of the model has zero energy and infinite degeneracy. The connection between this degeneracy and the properties of the Nicolai-Parisi-Sourlas transformation is discussed.

3845 **(WIS-PH—83/23) Solitons in the Peierls condensate. I phase solitons.** Horowitz, B.; Krumhansl, J.A. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). May 1983. 49p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700008.

The electron-phonon system in one dimension is studied within the adiabatic (Hartree) and Hartree-Fock approximations. The equations of motion for the Peierls order parameter at zero temperature are derived from a microscopic Hamiltonian and an effective Lagrangian is constructed. Charged phase solitons describe systems whose electron density is at or near M fold commensurability with M >= 3. For M = 2 the order parameter is real in the adiabatic approximation, but becomes complex when both acoustic and optical phonons are coupled, or for a non-adiabatic theory. The latter is studied with Coulomb exchange force and phase solitons are derived. The soliton charge is 2/M for all M > = 2. When M = 4 the pinning potential can be anomalously low, in agreement with data on $TaS_3$ and similar compounds.

3846 **(WIS-PH—83/24) Fractional charge and anomalous commutators.** Frishman, Y.; Gepner, D.; Yankielowicz, S. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). Jun 1983. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700009.

Non-integer charges on topological objects in the presence of fermions are further investigated. The connection with anomalous commutators is discussed. The reason for the identical results in two-dimensional solutions and four-dimensional monopoles is pointed out.

3847 **Comment on "quark confinement and the Dirac equation".** Olsson, M.G. (Physics Department, University of Wisconsin, Madison, Wisconsin 53706). *American Journal of Physics;* **51**: No. 11, 1042-1043(Nov 1983). Contract AC02-76ER00881.

The effect of the "Klein paradox" on the quarkonium energy levels is discussed. (AIP)

3848 **Simple rules for discontinuities in finite-temperature field theory.** Weldon, H.A. (Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19104). *Physical Review* [*Section*] *D: Particles and Fields;* **28**: No. 8, 2007-2015(15 Oct 1983).

The discontinuity, or imaginary part, of the self-energy function at Tnot =0 is found to be of the form Γ = Γ/sub d/minus-orplusΓ/sub i/ for bosons and fermions, respectively. The generalized decay rate Γ/sub d/ and inverse decay rate Γ/sub i/ are recognizable as integrals over phase space of amplitudes squared, weighted with certain statistical factors that account for the possibility of particle absorption from the medium or particle emission into the medium. Nonequilibrium statistical mechanics shows that Γ gives precisely the rate at which the single-particle distribution function approaches the equilibrium form.

3849 **Feynman rules for gauge fields in the presence of a dielectric medium.** Perry, R.J. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Physical Review* [*Section*] *D: Particles and Fields;* **28**: No. 8, 2099-2100(15 Oct 1983).

T. D. Lee's method for developing the Feynman rules for gauge fields in a cavity is reformulated in terms of path integral. His work is then extended by deriving these rules, in the Feynman gauge, for a spherical cavity. In any gauge only the gauge particle propagator is altered, while all the Feynman rules for gauge field couplings are left unaltered by the presence of a dielectric medium.

3850 **Monte Carlo studies of Wilson loops in SU(5) gauge theory in four dimensions.** Barkai, D.; Creutz, M.; Moriarty, K.J.M. (Center for Applied Vector Technology, Control Data Corporation at the Institute for Computational Studies, Colorado State University, Fort Collins, Colorado 80523). *Physical Review* [*Section*] *D: Particles and Fields;* **28**: No. 8, 2101-2103(15 Oct 1983). Contract AC02-76CH00016.

Monte Carlo simulations on a $6^4$ lattice are used to calculate Wilson loops, and hence the string tension, for pure SU(5) gauge theory. A bound is obtained for the string tension.

3851 **Bianchi-symmetric metrics.** Harvey, A. (Physics Department, Queens College City University of New York, Flushing, New York 11367). *Physical Review* [*Section*] *D: Particles and Fields;* **28**: No. 8, 2121-2121(15 Oct 1983).

New, simple, Bianchi I, II, and IX metrics are presented. They were obtained by means of computer-based algebraic manipulators. The scheme is described.

3852 **Symmetry and symmetry breaking in generalized parastatistics.** Levine, R.Y.; Tomozawa, Y. (Department of Physics, University of Michigan, Ann Arbor, Michigan 48109). *Annals of Physics (New York);* **149**: No. 2, 457-481(Sep 1983).

An analysis is made of the characteristics of internal symmetry and symmetry breaking in a quantum field theory with generalized parastatistics, defined by either double commutation relations or single commutation relations. The connection between the two statistics is clarified. We develop a formalism in which statistics is viewed as a dynamical or phase variable of quantum systems. It is shown that the types of Higgs phases possible depend upon statistics. Relationships between physical amplitudes implied by internal symmetry with normal statistics are violated in the case of generalized parastatistics.

3853 **Link fermions and dynamically correlated paths for lattice gauge theory.** Brower, R.C. (Harvard Univ., Cambridge, MA (USA). Lyman Lab. of Physics); Giles, R.C. (Massachusetts Inst. of Tech., Cambridge (USA). Lab. for Nuclear Science); Kessler, D.A. (Los Alamos National Lab., NM (USA). Theoretical Div.); Maturana, G. (California Univ., Santa Cruz (USA). Physics Dept.). *Physics Letters,* [*Section*] *B;* **126**: No. 5, 359-365(7 Jul 1983).

The calculation of fermion bound states in lattice QCD is discussed from the point of view of the Feynman path integral and the corresponding lattice 'path sum' representation of the fermion propagator. Path sum methods which correlate the trajectories of valence fermion and antifermion constituents of a meson bound state are presented. The resultant Monte Carlo algorithm for the meson propagator samples predominantly those configurations which are expected to be most important for a tightly bound system. Relative to other techniques, this procedure anticipates cancellations due to gauge field averaging, and in addition, allows a more detailed examination of the bound state wavefunction. Inspired by the fermionic path representation of the 2D Ising model, we also introduce a new class of lattice fermion actions with nearest neighbor interactions between Grassman variables associated with links. These link fermions are a simple generalization of Wilson's fermions. They have an additional corner weight param-

eter which can be adjusted to obtain a much improved dispersion relation for moderate and parge lattice momenta.

3854 **Do light colored scalars exist?.** Dawson, S.; Hill, C.T. (Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, Illinois 60510). *Annals of Physics (New York);* **148**: No. 2, 282-307(Jul 1983).

The general question of the properties of light, neutral colored spin-zero particles in QCD is examined. Models ith spontaneous breaking of QCD at very large distances, such as that of DeRujula, Giles, and Jaffe and the SO(3) scheme of Slansky, Goldman, and Shaw, require such light colored Higgs scalars. These scalars will form color-singlet hadronic bound states at short distances and estimates are given of bound state masses, decay widths, and production rates in processes such as psi $\rightarrow \gamma + X$ within the MIT bag model. The resulting states are expected in the mass neighborhood $\sim$1.5 GeV and should resemble glueballs.

3855 **Monte Carlo computations in lattice gauge theories.** Creutz, M. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.); Jacobs, L. (California Univ., Santa Barbara (USA). Inst. for Theoretical Physics); Rebbi, C. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.). *Physics Reports: A Review Section of Physics Letters (Section C);* **95**: No. 4, 203-282(Apr 1983).

With 120 refs.

The formulation of gauge theories on Euclidean space-time lattices and the application of the Monte Carlo computational technique to the ensuing systems are reviewed. A variety of numerical results obtained for lattice gauge theories are presented and discussed.

### 6455 Scattering Theory

*REFER ALSO TO CITATION(S) 3744, 4027*

3856 **Group theory approach to scattering.** Alhassid, Y.; Guersey, F.; Iachello, F. (A. W. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06511). *Annals of Physics (New York);* **148**: No. 2, 346-380(Jul 1983). Contract AC02-76ER03074;AC02-76ER03075.

We show that both bound and scattering states of a certain class of potentials are related to the unitary representations of certain groups. In this class, several potentials of practical interect, such as the Morse and Poeschl—Teller potentials, are included. The fact that not only bound states but also scattering states are connected with group representations suggests that an algebraic treatment of scattering problems similar to that of bound state problems may be possible.

## 65 PHYSICS RESEARCH

3857 **(INIS-mf—8567) Progress report 1981.** Chalupka, A.; Dirninger, G. (eds.). (Oesterreichische Akademie der Wissenschaften, Vienna). 1982. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703832.

The progress report describes the scientific work and research results of the institute for radium research and nuclear physics of the Austrian Academy of Sciences for the period of 1981. The progress report covers the subject areas of nuclear theory, nuclear model calculations, experimental nuclear physics and neutron involved reactions, medium energy physics, instrumentation and detectors, evaluation of nuclear data and numerical data processing, dating, applications in medicine, dosimetry and environmental studies. A list of publications of this institute is given.

3858 **(INIS-mf—8568) Progress report 1982.** Chalupka, A.; Wild, E.; Dirninger, G. (eds.). (Oesterreichische Akademie der Wissenschaften, Vienna). 1983. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703833.

The progress report describes the scientific work and research results of the institute for radium research and nuclear physics of the Austrian Academy of Sciences for the period of 1982. The progress report covers the subject areas of nuclear theory, nuclear model calculations, experimental nuclear physics and neutron involved reactions, medium energy physics, instrumentation and detectors, evaluation of nuclear data and numerical data processing, dating, applications in medicine, dosimetry and environmental studies. A list of publications of this institute is given.

3859 **(INIS-mf—8569) Progress report 1982.** Paul, H. (Johannes Kepler Univ., Linz (Austria)). 1983. 22p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703834.

This progress report describes the scientific work and research results done by the institute for experimental physics, atom and nuclear physics of the Johannes-Kepler-Universitaet Linz in the period of 1982. The covered subject areas are ionization by cations, investigations of surface areas by light ions, measurement of stopping power in solids, data acquisition and aerosol physics.

3860 **(INIS-mf—8570) Progress report 1981.** Paul, H. (Johannes Kepler Univ., Linz (Austria)). 1982. 18p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703835.

This progress report describes the scientific work and research results done by the institute for experimental physics, atom und nuclear physics of the Johannes-Kepler-Universitaet Linz in the period of 1981. The covered subject areas are ionization by cations, investigations of surface areas by light ions, measurement of stopping power in solids, data acquisition and aerosol physics.

3861 **(INIS-mf—8571) Progress report 1981/82.** Kocevar, P. (Graz Univ. (Austria)). 1982. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703836.

This progress report describes the scientific work and research results of the institute for theoretical physics of the Karl-Franzens-Universitaet Graz for the period Oct. 1981 - Sept. 1982. A short description of the research projects is given covering the subject areas of electromagnetic processes, field theory, elementary particles, nuclear physics, semiconductor physics and quantum theory. A comprehensive list of publications is given.

### 6510 Nuclear Physics

*REFER ALSO TO CITATION(S) 2324, 2325*

3862 **(DOE/ER/05224—7) Research in experimental nuclear physics. Progress report, 1 April 1983-31 March 1984.** (Texas Univ., Austin (USA)). Nov 1983. Contract AS05-76ER05224. 12p. NTIS, PC A02/MF A01. Order Number DE84002583.

Portions are illegible in microfiche products.

This report summarizes the work carried out by personnel from the University of Texas at Austin at the Los Alamos Clinton P. Anderson Meson Physics Facility (LAMPF) during the calendar year 1983. The research activities involved experiments done with the Energetic Pion Channel and Spectrometer (EPICS), the High Resolution Spectrometer (HRS), and some work has been done at Argonne National Laboratory and Kernforschungsanlage, Juelich, West Germany. This report lists the published papers and preprints supported by this contract. (WHK)

3863 **(EUR—7926) 1981 Annual status report. Nuclear measurements.** (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements). 1982. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703829.

The Nuclear Measurements programme is divided into two main projects, Nuclear Data on the one hand and Nuclear Reference Materials and Techniques on the other. In the former the JRC actions form part of world-wide sets of actions to establish reliable, and in many cases very precise, figures for important nuclear parameters - e.g. neutron interaction cross-sections, radio-nuclide half lives. In this work the Central Bureau for Nuclear Measurements

(CBNM) pays particular attention to the specific needs of the Community and to complement similar actions undertaken in the laboratories belonging to the Member States. Concerning Nuclear Reference Materials and Techniques the actions are to provide materials to which analytical and other measurements carried out in the nuclear industry or by the nuclear community can be referred. The basic aim of the Nuclear measurement programme is therefore to develop nuclear metrology with special orientation towards satisfying the demands for basic nuclear data and for materials and methods or reference.

3864 (LA—9798-P, pp 104-108) **New horizons in nuclear physics.** Gibbs, W.R.; Ginocchio, J.N.; Peng, J.C.; Stein, N. (Los Alamos National Lab, NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

New areas for nuclear physics research at LAMPF II are discussed including antiproton-nucleus physics, coherent meson production, quark degrees of freedom, and hyponuclei (nuclear matter with positive strangeness). (WHK)

3865 **Recent References January through April 1983.** Ramavataram, S. (Brookhaven National Laboratory, Upton, New York 11973). *Nuclear Data Sheets;* **37**: No. 4, 595-717(Dec 1982). Contract AC02-76CH00016.

Keywords, a reaction index, and references are given for literature received by the National Nuclear Data Center or assigned key numbers between January and April 1983. (AIP)

## 6512 Nuclear Properties And Reactions, A=1-5

*REFER ALSO TO CITATION(S) 3474, 3885*

3866 **(INIS-mf—8265) Study of the particle unstable S-nucleus resonances $^5$Lisup(3/2-) and $^5$Hesup(3/2-) in the reaction $\alpha$+d->$\alpha$+p+n at the c.m. energy Esub(CMS)=9,3 MeV.** Berghaus, U.F.W. (Hamburg Univ. (Germany, F.R.). Fachbereich Physik). 2 Feb 1982. 108p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83704389.

The $\alpha$-particle induced Deuterium break-up was measured at a center of mass energy of 9.3 MeV in kinematically complete experiments. For the purpose of testing the dependence on charge caused effects (n, $\alpha$)- and (p, $\alpha$)-data of coincidence were taken simultaneously. The particle instable 5 nucleon systems $^5$Hesup(3/2-) and $^5$Lisup(3/2-), which occur for a short time as intermediate resonances in their ground states, were counted in an angular correlation experiment. For the detection of $\alpha$-particles emitted in the decay of the intermediate resonances a broad ranged but not local sensitive Si(Li)-detector was used, built up by the Schlumberger Company. The immediate produced protons in $\alpha$+d -> $^5$Hesup(*)+p were registered in normal sized Si(Li)-detectors made by KEVEX, the neutrons from $\alpha$+d -> $^5$Lisup(*)+n were measured with NE213 filled scintillation counters manufactures by Nuclear Enterprises. From the cross sections in the recoil center of mass system the four tensor polarizations for rank 2 were extracted and compared with the resonating group model of Hackenbroich et al. with respect to the different charged channels. The predictions for the energy (Tsub(p) or Tsub(n)) dependent cross section in the three particle break-up calculated by Koike using Faddeev theory and Hackenbroich using resonating group method are shown in comparison with the experimental results. Discrepancies are found especially in the $^5$He +p-channel and their increasing with the center of mass angle (THETAsub(CMC) approx.= 130°). By means of the angular-correlation function W(THETA, phi) a more strong coupling of the $^5$Lisup(*)+n-channel to the reaction plane compared with the $^5$Hesup(*)+p-channel was found at the same production angle (THETAsub(CMS) approx.= 99°). The features of Coulomb interaction are seen to be approximated too crude in both theoretical models.

3867 **(ISN—82-50) Weak nucleon-nucleon interaction in few body systems.** Avenier, M. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). Nov 1982. 6p. (CONF-820991—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704289.

From 8. international workshop on weak interactions and neutrinos; Javea, Spain (5 Sep 1982).

The forward-backward asymmetry A$\gamma$ of the $\gamma$ ray angular distribution in the radiative capture of polarized neutrons by protons is a very sensitive test of the weak neutral current between nucleons. Due to the $\Delta S = 0$ rule and quark confinement, weak neutral effects appear only in low energy nucleon-nucleon interactions.

3868 **(JINR—E-2-82-409) Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers.** Saakian, S.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700066.

Within the multiple scattering model the inclusive cross sections $^3$Hed → $^3$HeX and $^4$Hed → $^4$HeX are calculated. At momentum transfers per nucleon of a scattered nucleus of 0.5 GeV/c in momentum spectra a fine structure arises because of the separation of contributions from different mechanisms of multiple scattering. In nucleon spectra in the reaction N$\pi$ → NX such a structure is suppressed by relativistic contraction.

3869 (LA—9798-P, pp 29-31) **Study of pion-nucleus reactions with high-energy pion beams.** Piasetzky, E. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

With the availability of higher energy pion beams at LAMPF II, one may expect to extend the study of pion-nucleus reactions to a higher energy region (300 MeV to 1.5 GeV). General motivation for the high-pion-energy studies is discussed and three typical experiments are proposed. These experiments are expected to give us extensive information pion absorption and production in nuclei as well as pion-induced nuclear knockout reactions.

3870 (LA—9798-P, pp 111-117) **Muon capture in nuclei.** Walecka, J.D. (Stanford Univ., CA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Muon capture plays a very important role in the elucidation of the structure of the semileptonic weak interactions; it can be used to place tight constraints on the form of the weak-current density in the nucleus. The nucleus presents an ideal microscopic laboratory for studying weak interactions. The many nuclear transitions and selection rules serve to isolate various pieces of the weak current. The present level of accuracy in the theoretical analysis, which uses electron scattering to determine one-body densities including both their spatial and spin dependences, is ~ 5 to 10%. An order-of-magnitude improvement in the experimental values of the partial-capture rates, as well as the systematic extension of measurements of partial-capture rates and corresponding correlation and polarization phenomena, should lead into a new realm where it is possible to study the effects of exchange currents in the nucleus on the weak axial-vector current.

3871 (LA—9798-P, pp 122-125) **Nuclear physics experiments using muons.** Walecka, J.D. (Stanford Univ., CA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A summary of possible new nuclear physics studies using muons emphasizes the advantages of future dc and pulsed muon beams at LAMPF II as well as the need for more precise muon capture measurements. Muonic x-ray and muon-induced fission experiments are also presented.

3872 **(LA-UR—83-2763) Deuteron forward photodisintegration: meson currents and relativity.** Friar, J.L. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 16p. (CONF-8310207—1). NTIS, PC A02/MF A01. Order Number DE84001314.

From Workshop on perspectives in nuclear physics at intermediate energies; Trieste, Italy (10 Oct 1983).

The few-nucleon problem in nuclear physics and the few-electron problem in atomic physics are shown to possess similarities. Relativistic aspects of the latter are reviewed. The radiative decay of the $^3P_1$ excited state of helium-like ions to the $^1S_0$ ground

state is shown to be a theoretical analogue of low-energy deuteron forward photodisintegration. Both have large relativistic components. The extended Siegert's theorem, which permits application of Siegert's technique to arbitrary photon wave lengths, is applied to both transitions. Physical arguments for the two processes are stressed, and the relevance of interaction currents is discussed. 28 references.

3873 **Effects of the $^3$He D state in the reaction $^2$H(p,γ)$^3$He.** King, S.E.; Roberson, N.R.; Weller, H.R.; Tilley, D.R. (Duke University, Durham, North Carolina 27706, and Triangle Universities Nuclear Laboratory, Durham, North Carolina 27706). *Physical Review Letters;* **51**: No. 10, 877-880(5 Sep 1983).

Angular distributions of the reaction $^2$H(p,γ) $^3$He have been measured for E/sub p/ from 6.5 to 16 MeV. A comparison of the extracted $a_2$ coefficients with an effective two-body direct calculation indicates a sensitivity to the inclusion of D-state components in the $^3$He wave function. These calculations use $^3$He bound-state wave functions generated from Faddeev-type equations. The theoretical three-body $^3$He ground-state wave functions having D-state probabilities of 5%—9% ($D_3$ = -0.224 to -0.236) are consistent with the present data.

3874 **Configuration space Faddeev continuum calculations: p-d s-wave scattering length.** Friar, J.L.; Gibson, B.F.; Payne, G.L. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 983-994(Sep 1983).

Formulation of s-wave zero-energy Faddeev-type scattering equations including a Coulomb interaction is discussed. Numerical solutions of these equations for the s-wave NN potential models of Malfliet and Tjon are obtained using spline techniques. Kohn variational estimates are presented and comparison is made to previously published results. Our quartet pd scattering lengths are larger than others previously obtained, and our pd doublet results are smaller than the corresponding nd results, and thus in contrast to the experimental values. An explication of this feature is presented in terms of a model two-body problem. Perturbation theory for the Coulomb corrections to the scattering length is developed and confirms the Kohn estimates.

## 6513 Nuclear Properties And Reactions, A=6-19

*REFER ALSO TO CITATION(S) 3768, 3864, 3865, 3885, 3976*

3875 **(CEA-CONF—6674) $^{20}$Ne induced peripheral reaction at 30 MeV/nucleon.** Cassagnou, Y.; Conjeaud, M.; Dayras, R.; Harar, S.; Legrain, R.; Pollacco, E.C.; Volant, C.; Menet, J.; Viano, J.B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Jan 1983. 9p. (CONF-830117—15). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700073.

From 21. international winter meeting on nuclear physics; Bormio, Italy (24 Jan 1983).

Projectile-like fragment energy spectra from 30 MeV/nucleon Ne on C, Ni Ag and Au targets have been measured at different angles. A beam velocity and energy relaxed components are present in the spectra. Extracted values of the reduced momentum width $\sigma_0$ do not reach the fragmentation limit.

3876 **(CEA-CONF—6675) Projectile break-up of $^{14}$N at 62,7 MeV.** Bozek, E.; Cassagnou, Y.; Dayras, R.; Legrain, R.; Pagano, A.; Rodriguez, L.; Lanzano, G.; Palmeri, A.; Pappalardo, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Jan 1983. 10p. (CONF-830117—16). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700074.

From 21. international winter meeting on nuclear physics; Bormio, Italy (24 Jan 1983).

In plane and out of plane angular correlations between light particles and heavy ions have been measured in the reaction $^{14}$N + $^{12}$C at 62.7 MeV bombarding energy. Special attention has been given to the break-up of $^{14}$N into $^{13}$C + p, $^{12}$C + d and $^{10}$B + α. The observed correlations are consistent with sequential break-up of the $^{14}$N projectile. A Monte-Carlo calculation assuming isotropic emission of particles in the rest frame of the projectile from well defined states in $^{14}$N is in good agreement with the experimental angular correlations. From a comparison between calculated and experimental boron and carbon single energy spectra, it appears that after transfer reactions, sequential break-up of $^{14}$N is the dominant process to produce these nuclei.

3877 (LA—9798-P, pp 20-25) **Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV.** Barnes, P.D.; Eisenstein, R.A.; Franklin, G.; Wharton, W.R. (Carnegie-Mellon Univ., Pittsburgh, PA). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Energy loss spectrometers were used to study the scattering of antiprotons, kaons, and pions from $^{16}$O and $^{18}$O, at 800 MeV/c. Angular distributions were measured for angles $2^\circ \leqq \theta \leqq 24^\circ$. For antiprotons, no such data existed, and the extent to which the NN (s-channel) absorption dominates the scattering process was of interest. If absorption strongly dominates, the opportunity exists for probing the far outer regions of the nuclear surface. If the absorption is not overwhelming, the (t-channel) meson exchange pieces of the N anti N force can be expected to play a role in the scattering. Because these are different from the NN force, we may be able to learn useful physics by comparing anti p scattering to the proton data from LAMPF. The L vector . S vector force is of special interest in this regard. For kaons, scattering from the isotopic pair $^{16}$O to $^{18}$O was studied to explore further the reliability of the currently used multiple-scattering calculations for this scattering process. Pion scattering at this higher momentum would nicely complement the work done at LAMPF, SIN, and TRIUMF at energies around the (3,3) resonance and below. A test of this model in a different energy range would be helpful. The fact that $\pi^+$N and $\pi^-$N amplitudes are related by isospin invariance will be useful in understanding better the role of the Coulomb-nuclear interference in the scattering.

3878 (LA—9798-P, pp 32-37) **Double-charge-exchange reactions.** Bland, L.C. (Univ. of Pennsylvania, Philadelphia); Morris, C.L. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Pion double-charge-exchange (DCX) reactions have provided many surprises from experimental studies performed at LAMPF. Features of the present data set may indicate that DCX proceeds by excitation of $\Delta_{33}$ components in nuclear wave functions. The larger resonance-energy pion fluxes expected from LAMPF II will enable more complete experimental studies, which will yield further insight into the DCX reaction mechanism.

3879 (LA—9798-P, pp 38-45) **Tests of the $K^+$-nucleon interaction in nuclei: an inelastic-scattering survey.** Hintz, N.M. (Univ. of Minnesota, Minneapolis). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A proposal is made to measure elastic and inelastic angular distributions for $K^+$ scattering from $^{12}$C, $^{28}$Si, and $^{58}$Ni at laboratory bombarding momenta of 600, 800, and 1000 MeV/c. Excitation of selected natural-parity [$^{12}$C($2^+$), $^{28}$Si($5^-$), $^{58}$Ni($6^+$)] and unnatural-parity [$^{12}$C($1^+$), $^{28}$Si($6^-$)] states will allow tests of the underlying $K^{+-}$ nucleon amplitudes as well as the determination of nuclear transition densities for comparison with similar measurements using other probes.

3880 (LA—9798-P, pp 135-138) **Activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei.** Dropesky, B.J. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

We propose a number of exploratory activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei. Because of the anticipated large contamination of the kaon beams with pions, studies of kaon interactions will necessarily involve difference measurements, which should be feasible. The range of studies proposed includes measurements of beam-monitor reactions, spallation distributions, charge-exchange reactions,

nuclear fragmentation, and pion production [$(\pi,2\pi)$, $(\pi,3\pi)$]. Special emphasis will be placed on trying to make a systematic comparison between reactions induced by $K^+$ and $K^-$. Comparisons with theoretical models will be essential for the interpretation of the observed phenomena.

3881 **Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy.** Sennhauser, U.; Piasetzky, E.; Baer, H.W.; Bowman, J.D.; Cooper, M.D.; Matis, H.S.; Ziock, H.J.; Alster, J.; Erell, A.; Moinester, M.A. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters;* **51**: No. 15, 1324-1327(10 Oct 1983).

The $0^0$ differential cross sections of $(\pi^+,\pi^0)$ reactions on a series of nuclei to isobaric analog states were determined at 165, 230, and 295 MeV. For each energy, the A dependence is well described by a power law of the form $\sigma$ = g(E)(N-Z)A/sup( - alphaE/), where $\alpha$(E) is a decreasing function of energy. The $0^0$ excitation functions peak around the (3,3) resonance energy for all nuclei except $^{90}$Zr. A possible explanation in terms of neutron and proton densities is discussed.

3882 **Inversion formula for the internucleus potential using sub-barrier fusion cross sections.** Balantekin, A.B.; Koonin, S.E.; Negele, J.W. (Center for Theoretical Physics, Laboratory for Nuclear Science, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1565-1569(Oct 1983). Contract AC02-76ER03069.

Subject to the assumption that sub-barrier fusion is described by an effective one-dimensional energy-independent local potential barrier, the Jeffreys-Wentzel-Kramers-Brillouin approximation for the fusion cross sections is inverted to determine this effective potential. Potential barriers, with their associated experimental errors, are presented for $^{12}$C+ $^{12}$C and $^{40}$Ca+ $^{40}$Ca, and the assumption of a local effective potential is shown to be inadequate for $^{64}$Ni+ $^{64}$Ni.

3883 **Factorization of fragment-production cross sections in relativistic heavy-ion collisions.** Olson, D.L.; Berman, B.L.; Greiner, D.E.; Heckman, H.H.; Lindstrom, P.J.; Crawford, H.J. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1602-1613(Oct 1983).

Analysis of the factorizability of several sets of fragment-production cross sections has been performed for $^{12}$C, $^{16}$O, $^{16}$O, and $^{56}$Fe projectiles in the 1 to 2 GeV/nucleon energy region for targets ranging from Be to U. The results of this analysis are considered in terms of geometrical concepts. No evidence is found that there is any dependence of fragmentation channel upon the impact parameter. It is found as well that the projectile dependence of the target factors is much less than that predicted by the abrasion-ablation theory, and also is less than that predicted by an excitation-decay model. Nevertheless, it appears that an excitation and decay mechanism is the dominant process in peripheral fragmentation.

3884 **Precompound analyses of spectra and yields following nuclear capture of stopped $\pi$p.** Blann, M. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1648-1662(Oct 1983).

The hybrid model has been modified for application in the energy region involved in capture of stopped negative pions (140 MeV). Comparisons of the improved formulation have been made with data from reactions induced by protons up to 164 MeV and the agreement was good. The model was used to predict n and p spectra and activation yields from stopped $\pi^-$ capture on targets from $^{12}$C to $^{209}$Bi, assuming a predominant quasideuteron capture mechanism. Predictions are given for primary versus secondary emission contributions to the spectra. Qualitative predictions for nn, np, and pp angular correlations are presented. Sensitivity of spectra and yields to parameters related to the nuclear density at which capture occurs is illustrated. While overall comparisons between calculated and experimental results are quite satisfactory, more detailed analyses suggest that a geometry dependent formulation integrating along the density profile for $\pi^-$ capture will be necessary, coupled with explicit treatment of enhanced nucleon emission probability versus nucleon induced reactions (due to momentum differences in the entrance channels) if such model results are to simultaneously reproduce particle spectra and yields.

3885 **Cross sections for the production of $^{11}$C in C targets by $^{12}$C at relativistic energies.** Smith, A.R.; McCaslin, J.B.; Geaga, J.V.; Hill, J.C.; Vary, J.P. (Lawrence Berkeley Laboratory, Berkeley, California 94720). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1614-1617(Oct 1983).

Cross sections for the production of $^{11}$C in C targets were measured using $^{12}$C ions with energies of 0.40, 1.05, and 2.1 GeV/nucleon. These measurements were undertaken for the purpose of establishing primary standards for use as beam monitors. Annihilation radiation from $^{11}$C(T/sub 1/2/ = 20.34 min) was counted using a large volume NaI detector. Cross sections of 63.5 +- 0.5, 57.4 +- 0.4, and 60.9 +- 0.6 mb, respectively, were obtained for 0.40, 1.05, and 2.1 GeV/nucleon $^{12}$C beams. The results are compared with earlier measurements of the cross sections in C targets using relativistic proton and $\alpha$ beams. Good agreement is found between the cross sections measured in this work and a simple Glauber theory.

3886 **Nuclear medium effects in pion elastic scattering and charge exchange.** Kaufmann, W.B.; Gibbs, W.R. (Department of Physics, Arizona State University, Tempe, Arizona 85281). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1286-1300(Sep 1983).

The three body approximation of the pion-nucleus optical model is used to calculate effective strengths to be used in conventional calculations. The resulting wave functions are used to calculate pion elastic scattering and single charge exchange. It is found that observed energy shifts in elastic scattering can be understood. Considerable change in the magnitude and shape (as a function of energy) of the charge exchange cross section is a direct result of these corrections.

3887 **Fusion and peripheral processes in the collisions of $^{20}$Ne+ $^{20}$Ne and $^{20}$Ne+ $^{16}$O.** Shapira, D.; DiGregorio, D.; del Campo, J.G.; Dayras, R.A.; Ford, J.L.C. Jr.; Snell, A.H.; Stelson, P.H.; Stokstad, R.G.; Pougheon, F. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1148-1160(Sep 1983).

Reaction products from the bombardment of $^{20}$Ne and $^{16}$O gas targets with $^{20}$Ne beams have been measured at five laboratory energies between 70 and 160 MeV. Fusion, deep inelastic, and quasielastic processes were studied. Large deep inelastic yields ($\sigma$/sub DI/> or $\approx$600 mb) with average Q values of -50 MeV are present at the highest energy. Analysis of the fusion cross sections for $^{20}$Ne+ $^{16}$O suggests that the maximum angular momentum in $^{36}$Ar populated via this entrance channel may be as low as 29 +- 2h.

3888 **Analysis of elastic and inelastic scattering of 162 MeV pions from $^{13}$C by an optical potential and a collective model.** Seestrom-Morris, S.J.; Dehnhard, D.; Franey, M.A.; Morris, C.L.; Boudrie, R.L.; Thiessen, H.A. (University of Minnesota, Minneapolis, Minnesota 55455 and Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1301-1308(Sep 1983).

Data for elastic scattering of $\pi^+$ and $\pi^-$ from $^{13}$C at T/sub $\pi$/ = 162 MeV between $\theta$/sub lab/ = $22^0$ and $105^0$ were analyzed by an optical model. Good fits were obtained with neutron and proton ground state densities of three-parameter Fermi shape having the same rms radius. Inelastic data for the quadrupole transitions to the $(3/2)^-$ (3.68 MeV) and $(5/2)^-$ (7.55 MeV) states and the octupole transition to a proposed $(5/2)^+$, $(7/2)^+$ doublet (11.82 MeV) were analyzed using a collective model. The extracted strengths for the neutron and proton parts of the transitions are compared to the results of electron scattering and $\gamma$-ray studies.

## 6514 Nuclear Properties And Reactions, A=20-38

*REFER ALSO TO CITATION(S) 3873, 3877, 3881*

3889 **(CEA-CONF—6649) Demonstration of a large deformation in the first stage of the sequence reaction $^{12}C(^{28}Si,\alpha\alpha)^{32}S(g.s.)$ by analysis of angular correlation measurements.** Alamanos, N.; Le Metayer, C.; Levi, C.; Mittig, W.; Papineau, L. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Mar 1983. 7p. (In French). (CONF-830394—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700071.

From 7. biennial meeting of nuclear physics; Aussois, France (14 Mar 1983).

The measurement of angular correlations of light particles emitted in sequence by a highly excited compound nucleus yields information on the angular momenta of the transitions. Detailed statistical model calculations have been used for a particular study of the sequence emission of $\alpha$ particles in the $^{12}C + ^{28}Si$ reaction, which leads to the first excited states of $^{32}S$ with energies between 60 and 90 MeV. The formation cross-section of the compound nucleus is calculated. The measured angular correlations are well represented by a statistical model calculation with a large deformation in the $^{40}Ca \rightarrow ^{36}Ar$ transition. Such a large deformation is compatible with the fusion configurations given by TDHF calculations. Structures superimposed on the mean cross-section from the statistical model are seen and it is shown that they are not due only to statistical fluctuations.

3890 **(CEA-N—1466-Pt.8) Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine.** Tobailem, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Mar 1983. 70p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE84700075.

Cross sections are reviewed for nuclear reactions induced by protons, deuterons, and alpha particles on chlorine targets. When necessary, published experimental data are corrected, and when possible, excitation functions are proposed.

3891 **(DOE/ER/40048—73-L3) Giant dipole resonances built on excited states.** Snover, K.A. (Washington Univ., Seattle (USA). Dept. of Physics). 1983. Contract AC06-81ER40048. 32p. (CONF-830970—3; CONF-8309169—1). NTIS, PC A03/MF A01. Order Number DE84001549.

From International symposium on highly excited states and nuclear structure; Orsay, France (5 Sep 1983).

Portions are illegible in microfiche products.

The properties of giant dipole resonances built on excited nuclear states are reviewed, with emphasis on recent results. Nonstatistical (p,$\gamma$) reactions in light nuclei, and statistical complex-particle reactions in light and heavy nuclei are discussed. 27 references.

## 6515 Nuclear Properties And Reactions, A=39-58

*REFER ALSO TO CITATION(S) 3706, 3869, 3873, 3876, 3877, 3882, 3976*

3892 (LA—9798-P, pp 26-28) **Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering.** Hoffmann, G.W.; Ray, L.; Coker, W.R. (Univ. of Texas, Austin). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The 800-MeV/c K+ elastic- and inelastic-scattering experiments from $^{40}Ca$, $^{48}Ca$, and $^{54}Fe$ are proposed with an overall experimental energy resolution of 0.5 MeV. These experiments are expected to provide important information on the usefulness of $K^+$ as a new probe for nuclear structure studies.

3893 **Half-life of $^{44}Ti$.** Frekers, D.; Henning, W.; Kutschera, W.; Rehm, K.E.; Smither, R.K.; Yntema, J.L.; Santo, R.; Stievano, B.; Trautmann, N. (Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 4, 1756-1762(Oct 1983). Contract W-31-109-ENG-38.

The half-life of $^{44}Ti$ has been measured to be T/sub 1/2/ = 54.2 +- 2.1 yr, somewhat higher than previously published values of 46.4 +- 1.7 and 48.2 +- 0.9 yr. The present value was obtained from the specific activity and the radioisotope concentration of several $TiO_2$ samples, each spiked with a $^{44}Ti$ activity of about 1.2 $\mu$Ci. The specific activity was measured via the 1157 keV $\gamma$ line from the decay of the $^{44}Sc$ daughter. $^{44}Ti/Ti$ concentrations were measured with the Argonne FN tandem accelerator in conjunction with an Enge split-pole magnetic spectrograph using the technique of accelerator mass spectrometry. An overall sensitivity of $10^{-10}$ was achieved which proves accelerator mass spectroscopy to be a powerful tool for radioisotope detection also in a region of rather heavy ion masses. A detailed description of the subtleties of accelerator mass spectroscopy when applied to measure absolute radioisotope concentrations in this heavy mass region is presented.

3894 **Precompound analyses of $^{58-64}Ni(n,px)$ reactions.** Castaneda, C.M.; Ullmann, J.L.; Brady, F.P.; Romero, J.L.; King, N.S.P.; Blann, M. (University of California, Davis, California 95616). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 4, 1493-1497(Oct 1983).

Data for the inclusive (n,px) reaction for 60 MeV neutrons on /sup 58,60,62,64/Ni are presented. Angular distributions for Q-value bins show a decrease of the forward peaking of the proton emission with increasing neutron excess. A marked dependence of the angle integrated spectra on (N-Z) is observed. The data are compared to hybrid and geometry dependent hybrid model calculations. Although these results predict the general shape of the spectra, they do not account for (N-Z) dependence. A neutron skin, as given by a hydrodynamic model, is added to the geometry dependent hybrid model, which predicts a higher precompound decay for high impact parameters. These results agree much better with the N-Z dependence of the data.

3895 **Energy dependence of the relativistic impulse approximation for proton-nucleus elastic scattering.** Clark, B.C.; Hama, S.; Mercer, R.L.; Ray, L.; Hoffmann, G.W.; Serot, B.D. (Department of Physics, The Ohio State University, Columbus, Ohio 43210). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1421-1424(Sep 1983).

Results of relativistic and nonrelativistic impulse approximation calculations are compared for p+ $^{40}Ca$ elastic scattering observables between 181 and 1040 MeV. At 400 MeV and above the relativistic approach is superior, especially with regard to spin observables. Below 400 MeV neither calculation agrees well with experiment.

3896 **Level structure of $^{67}Ge$ and its implications for the general structure of nuclei in the 1f-2p shell.** Murphy, M.J.; Davids, C.N. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1069-1079(Sep 1983).

From the results of prompt and $\beta$-delayed $\gamma$-ray singles and $\gamma$-$\gamma$ coincidence measurements, twenty-four excited states and forty-six gamma transitions are identified in the level scheme of $^{67}Ge$. Angular distributions and directional correlations of prompt $^{67}Ge$ gamma rays have been measured to obtain the spins of the $^{67}Ge$ ground state and excited states at 18.2, 122.7, 243.6, 711.3, and 1019.9 keV. Parities are assigned to the first five states on the basis of fp shell systematics and observed $^{67}Ge$ gamma-ray branching ratios. The 752-keV excitation energy of the first $(9/2)^+$ level in $^{67}Ge$ is determined from an excitation function for the $^{64}Zn(\alpha,n\gamma)^{67}Ge$ reaction. The angular distribution and correlation measurements also provide E2/M1 mixing ratios for the 104.4, 120.8, 122.7, 243.6, 589.0, and 897.5 keV $^{67}Ge$ gamma rays. The level scheme of $^{67}Ge$ and the corresponding schemes for /sup 63,65/Ni, /sup 65,67/Zn, and $^{69}Ge$ are observed to have strong similarities at low excitation. Systematic trends in E2 transition rates are interpreted in the context of shell and collective features of the nuclei. It is found that models based on a single particle coupled to a vibrational or deformed core do not explain the observed systematics, and are an inaccurate representation of these nuclei. The systematics do agree with a many-nucleon shell model emphasizing the short-range pairing interaction and configuration mixing for the valence neutrons.

3897 **Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon.** Breuer, H.; Mignerey, A.C.; Viola, V.E.; Wolf, K.L.; Birkelund, J.R.; Hilscher, D.; Huizenga, J.R.; Schroeder, W.U.; Wilcke, W.W. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1080-1103(Sep 1983).

Projectilelike fragments from reactions of 465-MeV $^{56}$Fe projectiles with targets of $^{56}$Fe, $^{165}$Ho, $^{209}$Bi, and $^{238}$U have been measured as a function of energy loss, and neutron and proton number. The mass and charge of each fragment were uniquely determined with discrete resolution. Data were analyzed as a function of energy loss by fitting a two-dimensional Gaussian function to the neutron-proton distributions. The fit parameters provide a convenient basis for comparison with theoretical predictions. In addition, centroids and variances derived from more detailed one-dimensional Gaussian fits to isobaric charge distributions are presented. Results are given for measured data as well as for the primary fragment distributions after correction for the dominant neutron evaporation. The centroid data show that in the asymmetric reactions proton transfer from projectile to target nucleus is preferred while the average fragment neutron number is largely preserved. This produces a charge equilibration process which is dependent on energy loss within the combined systems. The neutron and proton variances indicate an early dominant neutron flow followed by a constant relative neutron and proton exchange rate at energy losses above about 30 MeV. The degree of correlation of the neutron-proton distributions increases with energy loss and is found to be strongly related to the potential energy surface. Consistently observed negative correlation coefficients at low energy losses suggest the possible importance of processes other than particle exchange in the early stages of the interaction. Variances for constant N, Z, and A are found to saturate at energy losses and with magnitudes dependent on the target nucleus.

3898 **Neutron-induced gamma-ray production in $^{57}$Fe for incident neutron energies between 0.16 and 21 MeV.** Bell, Z.W.; Dickens, J.K.; Larson, D.C.; Todd, J.H. (Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tennessee 37830). *Nuclear Science and Engineering;* **84**: No. 1, 12-29(May 1983).

Interactions of neutrons with the iron isotope $^{57}$Fe have been studied by measuring gamma-ray production cross sections for incident neutron energies between 0.16 and 21 MeV. Neutrons produced by the Oak Ridge Electron Linear Accelerator impinged on a metallic iron sample enriched to 93% in the isotope $^{57}$Fe. The resulting gamma radiation was detected using a 100-cm$^3$ Ge(Li) detector placed at 125 deg with respect to the neutron beam line. A complete description of the experiment is given. Absolute gamma-ray production cross sections were measured for gamma rays corresponding to the $^{57}$Fe(n,n$^1\gamma$)$^{57}$Fe, $^{57}$Fe(n,$\gamma$)$^{58}$Fe, $^{57}$Fe(n,$\alpha$)$^{54}$ Cr, $^{57}$Fe(n,2n)$^{56}$Fe, and $^{57}$Fe(n,p)$^{57}$Mn reactions. The cross section for the $^{57}$Fe(n,2n)$^{56}$Fe reaction exceeds 1 b for E /SUB n/ about 15 MeV, and the cross section for the $^{57}$Fe(n,p)$^{57}$Mn reaction exceeds 0.2 b for E /SUB n/ about 9 MeV. A new excited state is postulated account for observed data. Several new transitions are reported for decay of levels in $^{57}$Fe. Measured cross sections are compared with data obtained from the current ENDF/B evaluation.

## 6516 Nuclear Properties And Reactions, A=59-89

*REFER ALSO TO CITATION(S) 3876, 3888, 3890, 3890, 3908*

3899 **(IPNO-DRE—83-02) Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn.** Bernas, M.; Dessagne, P.; Langevin, M.; Payet, J.; Pougheon, F.; Roussel, P.; Schmidt Ott, W.; Tidemand-Peterson, P. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1983. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700076.

The results of $^{14}$C induced transfer reactions performed with the Orsay MP Tandem accelerator on neutron rich targets nuclei $^{64}$Ni, $^{70}$Zn and $^{76}$Ge are given. Two proton pick-up were measured ($^{14}$C,$^{16}$O) as well as the next transfers ($^{14}$C,$^{17}$O) and ($^{14}$C,$^{18}$O). These measurements complete the results of the on line mass separation techniques applied to nuclei produced in deep inelastic or fragmentation reactions.

3900 **(JINR—E-4-82-512) Two-quasiparticle strength distributions in $^{62}$Ni and $^{206}$Pb.** Voronov, V.V.; Zhuravlev, I.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700067.

The fragmentation of two-quasiparticle states in $^{62}$Ni and $^{206}$Pb is calculated within the quasiparticle-phonon nuclear model. Experimental data for the one-nucleon transfer reaction spectroscopic factors and theoretical results are compared.

3901 **(LA—9798-P, pp 152-154) Nuclei far from stability produced by high-energy protons.** Bunker, M.E.; Butler, G.W.; Dropesky, B.J.; Talbert, W.L.; Vieria, D.J. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Two powerful and complementary techniques are described that could be used advantageously at LAMPF II for studying short-lived nuclei far from the line of beta stability, produced through fission or spallation reactions. The ground-state and excited-state properties of such nuclei are of great interest to nuclear model theorists. One of the proposed techniques utilizes a new type of recoil time-of-flight spectrometer that would enable the direct mass measurement of some 50 new neutron-rich isotopes in the light mass ($A < 70$) region with accuracies of 50 keV to 1 MeV. The second technique involves a so-called helium-jet-coupled mass separator, which would facilitate mass and spectroscopic measurements on short-lived isotopes of a number of elements (for example, refractory metals) that cannot be studied at any of the existing or planned on-line mass-separator facilities.

3902 **Estimation of neutron-induced spallation yields of krypton isotopes.** Karol, P.J.; Tobin, M.J.; Shibata, S. (Department of Chemistry, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1850-1852(Oct 1983).

A procedure is outlined for estimating cross sections for neutron-induced spallation products relative to those for proton-induced reactions. When combined with known proton spallation systematics, it is demonstrated that cumulative yields for cosmogenically-important stable $^{84}$Kr and $^{86}$Kr isotopes are ~1.4 and ~2.8 times greater, respectively, for incident neutrons compared to protons at 0.2< or =E< or =3.0 GeV for nearby medium mass targets. Yields for lighter kryptons are relatively insensitive to the identity of the incident nucleon.

3903 **Onset of damping in energetic heavy-ion interactions.** Kowalski, L.; Haustein, P.E.; Cumming, J.B. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters;* **51**: No. 8, 642-645(22 Aug 1983).

Measurements of longitudinal momenta transferred to mass-identified products of the fragmentation of Cu by $^{12}$C ions give clear evidence for a change in reaction mechanism between 22 and 84 MeV/u. Results at 84 MeV/u are generally consistent with peripheral interactions. However, at 22 MeV/u large momentum transfers observed for near-target products suggest that strongly damped processes have become important. Limits to momentum transfer of the type reported by Galin et al. are shown to arise in a natural way from this transition.

## 6517 Nuclear Properties And Reactions, A=90-149

*REFER ALSO TO CITATION(S) 3675, 3706, 3869, 3877, 3896*

3904 **(DOE/ER/02853—20) Studies of spin excitations with electromagnetic and hadronic probes.** Lindgren, R.A.; Petrovich, F. (Massachusetts Univ., Amherst (USA). Dept. of Physics and Astronomy; Florida State Univ., Tallahassee (USA). Dept. of Physics). 1982. Contract AC02-76ER02853. 32p. (CONF-820357—9). NTIS, PC A03/MF A01. Order Number DE84002648.

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

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Excitation of unnatural parity states, predominantly of high spin, using electromagnetic and hadronic probes, is discussed. Spectroscopic strengths are deduced from studies of (e,e'), (p,p'), ($\pi$,$\pi$'), and (p,n) for states whose doorway is the stretched particle-hole configuration. These levels are excited primarily through the isovector electromagnetic-nucleon magnetization coupling, nucleon-nucleon tensor coupling, and pion-nucleon spin-orbit coupling. The extracted isovector spectroscopic strength is typically 38% of the extreme single particle-hole model and about 66% of that predicted by more realistic nuclear structure calculations. The observed isoscalar strength is only about one half of the isovector strength. The results obtained with the three different probes are quite consistent. The primary conclusion is that the missing strength for these high spin excitations is at least as large as for the low spin M1 and GT excitations. This implies the existence of other important quenching mechanisms since the $\Delta$-$N^{-1}$ mechanism involved in the discussion of the low spin excitation affects only the isovector transitions and contributes little to high spin excitations. A method for using (e,e') and $\pi^+/\pi^-$ cross section ratios to separate and determine the absolute isoscalar and isovector spin densities for $T_0$ to $T_0$ transitions in N is not equal to Z nuclei is also discussed and some comments on extracting information from (e,e') and (p,p') studies at high q on low spin $1^+$ and $2^-$ levels are presented. 78 references.

3905 **(DOE/ER/40097—1) Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra.** Clark, D.D.; McElroy, R.D.; Yeh, T.R.; Chrien, R.E.; Gill, R.L. (Cornell Univ., Ithaca, NY (USA). Ward Lab.; Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-83ER40097. 20p. (CONF-830833—4). NTIS, PC A02/MF A01. Order Number DE84001129.

From International conference on nuclear physics; Florence, Italy (29 Aug 1983).

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An extensive program to obtain high resolution energy spectra of delayed neutrons of 1 to 100 keV energy from mass-separated fission products is under way using the on-line separator TRISTAN at the Brookhaven National Laboratory High Flux Beam Reactor. A time-of-flight method is employed, with Li-6 neutron and plastic beta scintillation detectors providing start and stop signals; the flight time and both detector pulse heights are recorded in event mode. With a flight path of 50 cm and FWHM time resolution of 2.9 ns, calculated FWHM energy resolutions are 2.1% at 3 keV and 5.5 at 100 keV. Transmission dips using a Cf-252 neutron source and Teflon absorbers are being measured to obtain empirical resolution functions at 27, 49 and 97 keV. Runs to date have been on Rb isotopes; in Rb-95, for example, peaks are found (intensities in parentheses) at 12.0 +- 0.2, 14.2 +- 0.1 (100), 26.3 +- 0.3 (2415), 56.5 +- 0.6, 64.3 +- 0.7 (8 +- 3), 93.3 +- 1 (20 +- 10), 103 +- 2, 120 +- 1.4, and 133 +- 2 keV. The end-point energy of the beta spectrum in coincidence with the 14-keV neutrons verifies that they populate the ground state of the GC nuclide, Sr-94. The observed FWHM of the 14-keV peak is 0.58 +- 0.07 keV, from which a (preliminary) natural line width of 0.30 +- 0.04 keV is deduced using the calculated system resolution. Further analyses and runs on other nuclides are planned. Reproductions of materials used in a poster presentation are given. (WHK)

3906 **(IPNO-DRE—83-07) Some aspects of recent progress in the study of giant resonances.** Frascaria, N. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Mar 1983. 23p. (In French). (CONF-830394—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700077.

From 7. biennial meeting of nuclear physics; Aussois, France (14 Mar 1983).

A brief review of the results obtained during the last few years in the study of giant resonances is given. Attention is then focused on the experiments using high energy hadron and heavy ion projectiles. The problems inherent to these new type of experiments are discussed.

3907 **(JINR—E-1-82-719) Experimental study of the pion-xenon collisions without particle production at 3.5 GeV/c: asymmetry in proton emission.** Strugalski, Z.; Pawlak, T.; Pluta, J. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704290.

In hadron-nucleus collision events without particle production, when the incident hadrons are deflected only in their passage through the target-nuclei accompanied by intensive target-nucleon emission, three planes can be naturally distinct - the hadron deflection plane and two planes simply related to it; the related planes are normally situated to the deflection plane. Asymmetries in proton emission, relative to two of these planes are found. Experimental data characterizing these asymmetries are presented.

3908 (LA—9798-P, pp 17-19) **Nuclear structure and nuclear reactions.** Gibbs, W.R.; Gibson, B.F.; Ginocchio, J.N.; Strottman, D. (comps.). (Los Alamos National Lab., TN). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Some of the possible uses of high energy pion and kaon beams for nuclear structure studies are discussed. (WHK)

3909 (LA—9798-P, pp 109) **Search for $K^+$-nucleus states with positive strangeness by the ($K^+$,p) knockout reaction.** Peng, J.C.; Stein, N.; Drake, D.M. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Using the ($K^+$,p) knockout reaction, this experiment proposes to search for possible $K^+$-nucleus bound or resonant states. Such states would indicate a form of nuclear matter possessing positive strangeness. The quasi-free knockout reaction $K^+p \rightarrow pK^+$ is the main experimental background anticipated.

3910 (LA—9798-P, pp 110) **Nuclear physics studies with muons.** Heffner, R.H. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

In addition to providing important information on fundamental symmetries and interactions, muon-capture studies can also be used to elucidate important features on nuclear structure. For example, the total muon-capture process is not thought to be dominated by capture through giant resonances; thus collective nuclear excitations and high-spin states are amenable to study. Note that the capture matrix elements measure the nuclear axial-vector transition densities. In this regard, Walecka has pointed out that the combination of (e,e') studies and muon-capture reactions can be used to answer fundamental nuclear structure questions such as whether one requires two-body densities for semileptonic transitions. Also, muon-induced fission in heavy promises to be an important tool for studying the dynamics of the fission process. (WHK)

3911 (LA—9798-P, pp 128) **Nuclear chemistry.** Dropesky, B.J.; Liu, L.C. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The prospect of high-intensity beams of kaons, antiprotons, and high-energy pions and protons from LAMPF II opens many exciting avenues of research for the nuclear chemistry community. In general, we emphasize direct determination of dynamic properties of the final nuclei in a nuclear reaction. These studies, although

inclusive, can be done efficiently and will provide information to guide the planning of more elaborate investigations.

3912 (LA—9798-P, pp 129-134) **New scientific information from LAMPF II.** Liu, L.C. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A large quantity of new information concerning nuclear structure, nuclear reaction mechanisms, and basic hadronic interactions inside a nucleus can be obtained by the use of high-energy pions and strange particles at LAMPF II. The possibility of studying these mesonic and strangeness degrees of freedom of a nucleus will undoubtedly provide new and excellent testing grounds for our current understanding of the nucleus and of the strong interaction as a whole.

3913 (LA—9798-P, pp 146-147) **Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei.** Lind, V.G. (Utah State Univ., Logan). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Prompt nuclear gamma rays from experiments of fast $K^{+-}$ interactions with nuclei provide a powerful and unique method for studying K-meson absorption and scattering in nuclei as well as the formation and decay of numerous hypernuclei and, hence, the role of the strange quark in the nuclear environment. Nuclear structure information also may be obtained from such experiments.

3914 (LA-UR—83-2927) **Dependence of the excitation energy, width, and cross section of the isovector monopole resonance.** Bowman, J.D.; Baer, H.W.; Cooper, M.D.; King, N.S.P.; Matis, H.S.; Piasetzky, E.; Alster, J.; Erell, A.; Lichtenstadt, J.; Sennhauser, U. (Los Alamos National Lab., NM (USA); Tel Aviv Univ. (Israel); Arizona State Univ., Tempe (USA); Schweizerisches Inst. fuer Nuklearforschung, Villigen). 1983. Contract W-7405-ENG-36. 6p. (CONF-830970—4). NTIS, PC A02/MF A01. Order Number DE84001908.

From International symposium on highly excited states and nuclear structure; Orsay, France (5 Sep 1983).

We have used the $(\pi^-,\pi^0)$ charge-exchange reaction at 165-MeV kinetic energy to study the T + 1 component of the isovector monopole resonance (IVM). The nuclei $^{40}$Ca, $^{61}$Ni, $^{90}$Zr, $^{120}$Sn, $^{140}$Ce, and $^{208}$Pb were used as targets. We also observed the T + 1 component of the giant dipole resonance (GDR) in the lighter targets. The $(\pi^+,\pi^0)$ reaction also yielded positive results for the T - 1 component of the IVM and GDR in $^{40}$Ca, $^{60}$Ni, and $^{90}$Zr. Results are reported.

3915 (NEANDC—J-91/U) **JNDC nuclear data library of fission products.** Tasaka, K.; Ihara, H.; Akiyama, M.; Yoshida, T.; Matumoto, Z.; Nakasima, R. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Oct 1983. 224p. (JAERI—1287; INDC(JAP)—78/L). NTIS (US Sales Only), PC A10/MF A01. Order Number DE84900011.

Portions are illegible in microfiche products.

The JNDC (Japanese Nuclear Data Committee) FP (Fission Product) nuclear data library for 1172 fission products is described in this report. The gross theory of beta decay has been used extensively for estimating unknown decay data and also some of known decay data with poor accuracy. The calculated decay powers of fission products using the present library show excellent agreement with the latest measurements at ORNL (Oak Ridge National Laboratory), LANL (Los Alamos National Laboratory) and UTT (University of Tokyo, Tokai) for cooling times shorter than $10^3$s after irradiation. The calculated decay powers by the existing libraries showed systematic deviations at short cooling times; the calculated beta and gamma decay powers after burst fission were smaller than the experimental results for cooling times shorter than 10 s, and in the cooling time range 10 to $10^3$s the beta-decay power was larger than the measured values and the gamma decay power smaller than the measured results. The present JNDC FP nuclear data library resolved these discrepancies in the short cooling time ranges. The decay power of fission products has been calculated for ten fission types and the results have been fitted by an analytical function with 31 exponentials. This permits the easy application of the present results of decay power calculations to a LOCA (Loss-of-Coolant Accident) analysis of a light water reactor and so on.

3916 **Delayed neutron precursors at masses 97—99 and 146—148.** Reeder, P.L.; Warner, R.A. (Pacific Northwest Laboratory, Richland, Washington 99352). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 4, 1740-1751(Oct 1983). Contract AC06-76RL01830.

Delayed neutron emission probabilities, P/sub n/, have been measured for /sup 98,99/Sr, $^{97}$Y/sup g/,m, $^{98}$Y/sup g/, $^{99}$Y, $^{147}$Ba, and /sup 147,148/La. This is the first reported measurement for $^{97}$Y/sup m/. Upper limits to the P/sub n/ for $^{97}$Sr, /sup 146,148/Ba, and $^{146}$La were established. The P/sub n/ values measured here are much smaller than a set of published measurements. Calculations of total delayed neutron yields from fission are consistent with experimental measurements of total delayed neutron yields except for fast neutron fission of $^{238}$U. Improved half-lives are reported for 13 of the Rb, Sr, Y, Cs, Ba, and La nuclides at masses 97—99 and 146—148.

3917 **Excitation of the isoscalar giant quadrupole resonance in $^{118}$Sn$(\pi^{+-},\pi^{+-\prime})$.** Ullmann, J.L.; Kraushaar, J.J.; Masterson, T.G.; Peterson, R.J.; Raymond, R.S.; Ristinen, R.A.; King, N.S.P.; Boudrie, R.L.; Morris, C.L.; True, W.W. (University of Colorado, Boulder, Colorado 80309). *Physical Review Letters;* **51**: No. 12, 1038-1041(19 Sep 1983).

The isoscalar giant quadrupole resonance is studied in $^{118}$Sn$(\pi^{+-},\pi^{+-\prime})$ at 130 MeV. It is found that the ratio of $\pi^-$ to $\pi^+$ cross sections at their maximum is 1.9 and that 57% of the energy-weighted sum rule is exhausted in $\pi^-$ scattering. This large ratio of $\pi^-$ to $\pi^+$ cross sections is not anticipated by conventional models, and may be interpreted as evidence for substantial isovector strength.

3918 **Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A∼100 region.** Wohn, F.K.; Hill, J.C.; Petry, R.F.; Dejbakhsh, H.; Berant, Z.; Gill, R.L. (Ames Laboratory, U.S. Department of Energy and Iowa State University, Ames, Iowa 50011). *Physical Review Letters;* **51**: No. 10, 873-876(5 Sep 1983).

Six rotational bands have been found in $_{39}{}^{99}Y_{60}$, 1 $_{39}{}^{01}Y_{62}$, $_{38}{}^{99}Sr_{61}$, and 1 $_{40}{}^{01}Zr_{61}$. All bands have small and very similar values of $h^2/2$ scrI that indicate deformations of ∼0.3—0.4 and imply that these nuclei are among the most deformed known, with scrI∼0.8 scrI/sub rigid/. Relative strengths of intraband γ transitions suggest Nilsson orbital assignments of π 5/2 [422] for the Y ground bands.

3919 **Gamow-Teller strength function for $^{90}$Zr: Effects of spin and isospin exchange forces, and ground-state correlations.** Mathews, G.J.; Bloom, S.D.; Hausman, R.F. Jr. (University of California, Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1367-1373(Sep 1983).

Shell-model calculations of the Gamow-Teller strength function for $^{90}$Zr have been performed utilizing a realistic finite-range two-body interaction in a model space consisting of the 2p and 1g shells. The effects of admixtures of two-particle two-hole excitations in $^{90}$Nb, mostly due to the spin and isospin exchange components of the nucleon-nucleon force, are discussed. Ground state correlations in $^{90}$Zr are also added via seniority-zero two-proton excitations from the 2p shell into the 1g/sub 9/2/ shell. With the correlations the Gamow-Teller strength function is in good agreement with the experimental results and accounts for essentially all of the observed dispersion of strength. The inclusion of these correlations does not, however, produce either a displacement of Gamow-Teller strength to higher excitation energies, or a significant change in the total strength. Thus, they cannot account for the observed Gamow-Teller quenching. The quenching factor derived by a comparison of our calculated results with experiment is 0.52.

3920 **Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd.** Chasman, R.R. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1374-1378(Sep 1983). Contract W-31-109-ENG-38.

Proton and neutron single particle level spacings are determined for the A = 146 mass region, using a rotationally invariant interaction and recent experimental data. Excitation energies of spherical and deformed high spin states in $^{147}$Gd, the transition probability B(E2; $10^+ \rightarrow 8^+$) for several N = 82 isotones, and the $0^+$ excited state spectra of, and neutron pair transfer probabilities for, levels in $^{146}$Gd and $^{144}$Sm are calculated. Comparisons with experimental data are made.

3921 **Z dependence of strongly interacting relativistic nuclear fragments.** Mac Gregor, M.H. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review Letters;* **49**: No. 25, 1815-1818(20 Dec 1982). Contract W-7405-ENG-48.

Three different experimental groups have recently published the results of their investigations on highly interacting relativistic nuclear fragments (denoted as "anomalons"). These results are combined to form an anomalon data base, and then chi$^2$ analyses are used to demonstrate that the anomalon mean free paths are Z dependent. It is also demonstrated that these anomalon mean free paths lie on the boundary that delineates the "domain of nuclear forces."

## 6518 Nuclear Properties And Reactions, A=150-189

*REFER ALSO TO CITATION(S) 3891, 3914*

3922 **(DOE/ER/10599—21) Nuclear structure from radioactive decay. Annual progress report.** Wood, J.L. (Georgia Inst. of Tech., Atlanta (USA). School of Physics). 30 Sep 1983. Contract AS05-80ER10599. 15p. NTIS, PC A02/MF A01. Order Number DE84002643.

Studies of neutron-deficient nuclei around the Z = 82 shell closure, with special emphasis on the levels of the odd-mass Pt, Au, Hg, and Tl isotopes are described. Research on nuclear systematics and models is discussed, and publications are listed. (WHK)

3923 **(JINR—R-4-82-531) Vibrational states of deformed odd nuclei.** Solov'ev, V.G.; Nesterenko, V.O.; Bastrukov, S.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700068.

The equations for the description of vibrational states in deformed odd-A nuclei are obtained within the quasiparticle-phonon nuclear model. In these equations the Pauli principle is taken into account in the quasiparticle plus phonon components of the wave functions. It is shown that if in these components the Pauli principle is not violated or is slightly violated, the corresponding vibrational states may exist in deformed odd-A nuclei. If the Pauli principle is strongly violated in the quasiparticle plus phonon state, its centroid energy is shifted towards higher energies, and it can be fragmented over several levels. The analysis of the available experimental data on the low-lying vibrational states in deformed odd-A nuclei from $^{179}$Hf-$^{239}$Pu range has shown that the experimental data do not contradict the results of these calculations.

3924 **Nuclear data sheets for A = 153.** Lee, M.A. (Idaho National Engineering Laboratory EG & G Idaho, Inc., Idaho Falls, Idaho 83415). *Nuclear Data Sheets;* **37**: No. 3, 487-594(Nov 1982).

The experimental results from the various reaction and decay studied leading to nuclides in the A = 153 mass chain have been reviewed. These data are summarized and presented, together with the adopted level schemes and properties.

## 6519 Nuclear Properties And Reactions, A=190-219

*REFER ALSO TO CITATION(S) 3869, 3878, 3891, 3894, 3895, 3908, 3916, 3917*

3925 **(CEA-CONF—6651) Projectile fragmentation and light particle emission from 70 MeV/nucleon $\alpha$ particles on $^{197}$Au.** Blumenfeld, Y.; Cassagnou, Y.; Conjeaud, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Jan 1983. 11p. (CONF-830117—14). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700072.

From 21. international winter meeting on nuclear physics; Bormio, Italy (24 Jan 1983).

Light particles (p,d,t,$^3$He) energy spectra from 70 MeV/nucleon $\alpha$ on $^{197}$Au have been measured at angles ranging from $10^0$ to $30^0$ in the laboratory. The results have been analysed in terms of fragmentation and moving thermal source models. It is shown that $\alpha$ induced data display similar features as heavy ions data.

3926 **(CTA-EAV—001/81) Decay of 399 KeV isomeric state in $^{197}$Pt. A possible candidate for PAC studies.** Soares, J.C.; Melo, A.A.; Gil, F.B.; Saxena, R.N.; Dias, H. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Atividades Espaciais). Feb 1981. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704288.

The nuclear levels in $^{197}$Pt have been studied from decay of 95.4 min $^{197}$(sup m)Pt. The isomeric state was produced by (n,$\gamma$) reaction on the enriched $^{196}$Pt. The $\gamma$-ray spectra have been observed with a hyperpure Ge detector and a large volume Ge(Li) detector. The half lives of the 399 KeV and the 53 KeV states were determined with improved precision. The results are: T1/2 (399 KeV) = 95.41 +- 0.18 min and T1/2(53 KeV) = 16.58 +- 0.17 ns. The g-factor of the 53 Kev $5/2^-$ state has been measured by the gamma-gamma time differential perturbed angular correlation (TDPAC) method in an external magnetic field of 25.1 kG using the 346 - 53 KeV gamma cascade. The value of g-factor was obtained to be + 0.335 +- 0.010. This result is compared with the known g-factors of the similar states in $^{196}$Pt, and in $^{197}$Hg and $^{199}$Hg and also with the theoretical calculations based on the quasiparticle-phonon coupling scheme. Possibility of using the 346 - 53 KeV gamma cascade in $^{197}$Pt in the future TDPAC studies is discussed.

3927 **(INIS-mf—8257) Spectroscopy of the neutrons from the decay of the giant quadrupole resonance region in $^{208}$Pb.** Steuer, H. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik). 21 Jul 1981. 77p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83704388.

In the present thesis the neutron decay of the giant quadrupole resonance region in $^{208}$Pb was studied by the reaction chain $^{208}$Pb($\alpha$,$\alpha'$)$^{208}$Pbsup(GR)(n)$^{207}$Pb. For this at the Karlsruhe Isochronous Cyclotron an $\alpha'$-n coincidence experiment was performed with the energy-analyzed $\alpha$-beam of 104 MeV. The aim of this experiment was to determine the relative branching ratios of the neutron decay to the different states in the nuclear $^{207}$Pb. The branching ratios obtained from the experimental data show that the isomeric $13/2^+$ state is relatively strong populated from the decay of the giant E2-resonance region between 8.5 MeV and 12.5 MeV excitation energy in $^{208}$Pb. A comparison with the branching ratios, which were calculated for the different multipolarities in the framework of the statistical decay model, shows that because of the strong population of the $13/2^+$ state large contributions of multipolarities with L>=4 must be present in the giant E2-resonance region. The $\alpha$-spectra coincident to the single neutron decay channels show remarkable fine structure, especially also the strength distribution, which decays to the $13/2^+$ state.

3928 **(LA—9798-P, pp 148-150) Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles.** Kaufman, S.B. (Argonne National Lab., IL). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

The emission of light nuclear fragments by complex nuclei interacting with relativistic projectiles is discussed. Two types of experiments using kaons, antiprotons, pions, and protons at LAMPF II are suggested to investigate the mechanism of fragment formation.

3929 (LA—9798-P, pp 151) **Fragment emission in high-energy proton-nucleus interactions.** Porile, N.T. (Purdue Univ., Lafayette, IN). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Experiments to study the multifragment breakup of nuclei interacting with 1- to 15-GeV protons are described. The experiments consist of inclusive and semiexclusive counter studes as well as radiochemical studies.

3930 **Global test of modified precompound decay models.** Blann, M.; Vonach, H.K. (E-Division, Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 4, 1475-1492(Oct 1983). Contract W-7405-ENG-48.

A single parameter set was adopted for the hybrid and geometry dependent hybrid models. The nuclear density profile was modified for consistency with results of the Myers nuclear droplet model. Optical model parameters were modified to give better global results for inverse reaction cross sections in the precompound energy range up to 90 MeV. Two types of multiple precompound decay processes are defined, and the more important of the two is incorporated into the precompound decay formalism. This results in two to five orders of magnitude improvement in predicting $^{202}$Hg(p,2p) and $^{202}$Hg(p,2pn) product yields for proton energies up to 86 MeV. The global parameter set and formulation of this work is compared with (n,xn) and (n,p) spectra for 14 MeV incident neutrons, for (p,n) spectra with 18—90 MeV protons, and with (p,p') spectra for 39—90 MeV protons. The geometry dependent hybrid model gives the better overall agreement, in most cases within the 20—30 % limit of significance attached to the model. Some discussion is given of methods by which the calculations might be further improved.

3931 **Electromagnetic properties of isomers in $^{210}$Pb.** Decman, D.J.; Becker, J.A.; Carlson, J.B.; Lanier, R.G.; Mann, L.G.; Struble, G.L.; Maier, K.H.; Stoeffl, W.; Sheline, R.K. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1060-1064(Sep 1983).

The lifetimes and magnetic moments of the J/sup $\pi$/ = $8^+$ and $6^+$ isomers in $^{210}$Pb have been measured using the gamma-ray perturbed angular distribution technique. The levels were populated with the $^{208}$Pb(t,p)$^{210}$Pb reaction. The g factors of the $8^+$ and $6^+$ states are found to be -0.312(8) and -0.312(15), respectively. The magnetic moment, $\mu$ = -1.42(7) $\mu$/sub N/, is deduced for the 2g(9/2) neutron orbital. Mean lifetimes are 290(25) ns for the $8^+$ state and 71(9) ns for the $6^+$ state. We find <g(9/2)parallelM(E2)parallelg(9/2)> = -39(2) e fm$^2$ and an effective charge of 0.88(5) e for the 2g(9/2) neutron orbital.

3932 **High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes.** Dybdal, K.; Chapuran, T.; Fossan, D.B.; Piel, W.F. Jr.; Horn, D.; Warburton, E.K. (Department of Physics, State University of New York at Stony Brook, Stony Brook, New York 11794). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1171-1180(Sep 1983).

A spectroscopic investigation of high-spin states in /sup 201,203/At was performed by means of the reactions /sup 192,194/Pt($^{14}$N,5n)/sup 201,203/At with $^{14}$N energies between 85 and 100 MeV. In-beam measurements of $\gamma$-ray excitation functions, $\gamma$-$\gamma$ coincidences, $\gamma$-ray angular distributions, and pulsed-beam-$\gamma$ timing were made to determine the decay scheme, level energies, $\gamma$-ray multipolarities, spin-parity assignments, and isomeric lifetimes. The yrast and near-yrast level structures were established up to J~(25/2), and several isomers with mean lifetimes around 20 ns were observed. The systematic trends of level energies of the odd-mass astatine (Z = 85) isotopes are discussed in terms of proton-particle configurations of $^{211}_{85}At_{126}$ coupled to neutron-hole configurations of the corresponding even-mass lead isotones.

3933 **Observation of 2h$\omega$ hexadecapole strength in lead nuclei from 200 MeV inelastic proton scattering.** Tinsley, J.R.; McDaniels, D.K.; Lisantti, J.; Swenson, L.W.; Liljestrand, R.; Drake, D.M.; Bertrand, F.E.; Gross, E.E.; Horen, D.J.; Sjoreen, T.P. (University of Oregon, Eugene, Oregon 97403). *Physical Review* [*Section*] *C: Nuclear Physics;* **28**: No. 3, 1417-1420(Sep 1983).

Excitation of strength peaked at 12.0 MeV is observed in $^{208}$Pb and $^{206}$Pb via the inelastic scattering of 200 MeV protons. Based upon angular distribution measurements in $^{208}$Pb we interpret the strength as an isoscalar 2h$\omega$, L = 4, excitation.

3934 **Molecular alpha-particle clustering in $^{218}$Ra; dipole collectivity in the vicinity of nuclear shell closures.** Gai, M.; Ennls, J.F.; Ruscev, M.; Schloemer, E.C.; Shivakuma, B.; Sterbenz, S.M.; Tsoupas, N.; Bromley, D.A. (A. M. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06511). *Physical Review Letters;* **51**: No. 8, 646-649(22 Aug 1983). Contract AC02-76ER03074.

Evidence for the presence of alpha-particle clustering in $^{218}$Ra comes from a number of observables: binding energy S/sub 2n/, Q/sub $\alpha$/, E/sub x/(J/sup $\pi$/), $\theta$/sub $\alpha$/$^2$ and, F/sub $\alpha$/. That this clustering is a signature for the new dipole collectivity suggested by Iachello and Jackson follows from observation of simultaneous enhancement of selected E1, E2, and E3 deexcitation transition matrix elements; of these the E1 enhancement is most pronounced as would be expected for dipole collectivity.

## 6520 Nuclear Properties And Reactions, A=220 And Above

*REFER ALSO TO CITATION(S) 3891, 3895, 3910, 3917, 3922, 3923*

3935 (CERN—83-02-Vol.2, pp 477-488) **Quark matter formation in high energy nucleus-nucleus collisions - predictions and observations.** Otterlund, I. (Lund Univ. (Sweden). Div. of Cosmic and Subatomic Physics). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

In this talk I give a short summary of the recent discussion around predictions and possible observations of quark-gluon plasma and fireballs in ultrarelativistic nucleus-nucleus collisions. In particular, this talk is focused on heavy ion reactions at 200 A GeV.

3936 **(JINR—E-4-82-694) Nonradiative excitation of the muonic atom $^{238}$U as an inverse conversion process.** Karpeshin, F.F.; Nesterenko, V.U. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 5p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704287.

The probabilities of nonradiative nuclear excitation are calculated for different muon transitions in the muonic atom $^{238}$U. Microscopic nuclear wave functions, obtained within the quasiparticle-phonon nuclear model, and the muonic conversion coefficients have been used. The probability of nonradiative nuclear excitation for the muonic transitions 2p → 1s and 3p → 1s has been found to be equal to 0.3. It is predicted that nonradiative E3 transitions 3d → 2p can take place with the probability 0.08-0.10. The dynamic effect of nuclear structure on the probability of nonradiative nuclear excitation is taken into account. The estimates of $^{238}$U fissility fission branching at nonradiation transitions are also obtained.

3937 **(JINR—R-7-82-638) Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei.** Il'inov, A.S.; Mebel', M.V.; Cherepanov, E.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1982. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704291.

To obtain information about the shell effect behaviour in nuclei depending upon the excitation energy from the experimental (HI, xn) reaction cross sections, partial width emission of neutrons

and partial width of fission ratio GITAsub(n)/GITAsub(f) for present excitation energy are analyzed. The energy behaviour value GITAsub(n)/GITAsub(f)(E*) in the excitation interval 7<=E*<=70MeV for $^{239}$Pu, $^{244}$Cm, $^{247}$Bk, $^{248}$Cf, $^{256}$Md, $^{258}$102 nuclei are studied. Two experimental values of GITAsub(n)/GITAsub(f)(E*) are compared with the calculated values under two assumptions: a) the shell effects in nuclei totally disappear; b) the shell effects in nuclei smoothly disappear with the increasing excitation energy. The shell effects in heavy transuranium nuclei attached to E*>=30MeV disappear. The liquid drop barriers of fission from high energy data are extracted and comparison with the liquid drop model is made.

3938 (LA—9798-P, pp 118-121) **Study of fission dynamics by muon-induced fission.** Oberacker, V.E. (Vanderbilt Univ., TN); Maruhn, J.A. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Prompt fission of $^{242}$Pu induced by internal conversion in muonic atoms is studied theoretically. We treat the fission mode classically in terms of an elongation and a mass asymmetry coordinate and solve the time-dependent Schroedinger equation for the muon in the Coulomb field of the fissioning nucleus by methods similar to those of time-dependent Hartree-Fock. The muon attachment to the light and heavy fission fragment is calculated as function of the friction coefficient and the fragment mass asymmetry.

3939 (LA—9798-P, pp 126-127) **Muon-induced fission.** Gavron, A. (Los Alamos National Lab., NM). Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

A short discussion of possible muon-induced fission experiments at LAMPF II is presented. A measurement of the attachment probability of the muon to the light fission fragment provides a measure of the time scale of the fission process.

3940 **Comment on "Determination of gamma-ray energies and abundances of $^{229}$Th".** Dickens, J.K. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1404-1406(Sep 1983). Contract W-7405-ENG-26.

It is shown that the absolute normalizaton of γ-ray yields (I/sub γ/) for transitions among levels in $^{225}$Ra following α decay of $^{229}$Th reported by Rattan et al. should be increased by at least 22%. Disagreements of reported values of I/sub γ/ with those in a recent report are discussed but not resolved.

3941 **Identification of $^{233}$Ac.** Chu, Y.Y.; Zhou, M.L. (Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1379-1381(Sep 1983).

We report in this paper identification of the new isotope $^{233}$Ac. Uranium targets were irradiated with 28 GeV protons; after rapid retrieval of the target and separation of actinium from thorium, $^{233}$Ac was allowed to decay into the known $^{233}$Th daughter. Exhaustive chemical purification was employed to permit the identification of $^{233}$Th via its characteristic γ radiations. The half-life derived for $^{233}$Ac from several experiments is 2.3 +- 0.3 min. The production cross section for $^{233}$Ac is 100 μb.

3942 **Measurement of the /SUP 242m/ Am neutron fission cross section.** Dabbs, J.W.T.; Bemis, C.E.; Raman, S. (Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tennessee 37830). *Nuclear Science and Engineering;* **84**: No. 1, 1-11(May 1983).

The fission cross section of /SUP 242m/ Am has been measured from 0.005 eV to 20 MeV using time-of-flight techniques at the Oak Ridge Electron Linear Accelerator. A hemispherical plate fission ionization chamber with five pairs of plates contained three deposits totaling 507 μg of /SUP 242m/ Am, one deposit of 168 μg $^{235}$U, and a "weightless" deposit of $^{252}$Cf, which served as a monitor of chamber performance. The fission of $^{235}$U, served as the cross-section standard for energies above 101 keV while $^{6}$Li(n,α), normalized to $^{235}$U fission in the 7.8- to 11.0-eV interval, served as a shape standard below 101 keV. Approximately 360 h of data were obtained at a flight path distance of 9.1 m, primarily with 40-ns bursts. Particular attention was paid to correction of backgrounds, especially inscattered-neutron-induced events. The fission resonance integral was found to be 1800 + or - 65 b.

## 6530 Nuclear Theory

*REFER ALSO TO CITATION(S) 3618, 3706, 3731, 3890, 3894, 3915, 3928, 4027*

3943 (CERN—83-02-Vol.2, pp 489-513) **States of matter in QCD.** Satz, H. (Bielefeld Univ. (Germany, F.R.). Fakultaet fuer Physik). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

We survey the thermodynamics of strongly interacting matter, as predicted by quantum chromodynamics. At low values of temperature and density, we find hadronic matter, while at high values the system becomes a primordial plasma of non-interacting massless quarks and gluons. Separating the two regimes is a transition region in which colour deconfinement and chiral symmetry restoration take place. We obtain preliminary values for the transition parameters and discuss the possibility of observing plasma formation in high energy heavy ion collisions.

3944 (CERN—83-02-Vol.2, pp 514-515) **Theoretical aspects of nucleus-nucleus collisions.** Hofe, L. van (European Organization for Nuclear Research, Geneva (Switzerland)). 10 Feb 1983. NTIS (US Sales Only), PC A23/MF A01. (CONF-821256—Vol.2).

From Workshop on SPS fixed-target physics in the years 1984-1989; Geneva, Switzerland (6 Dec 1982).

3945 **(IFUSP-P—301) Do spin and charge- exchange resonances possess a R(4)- symmetry.** Chen, C.H.T. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1981. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704283.

It is suggested that spin- and charge-exchange resonances could be associated with a R(4) symmetry that should emerge from the consideration of these resonance states as those of many particle-hole phonons with various spin-isospin modes, taking a self-conjugate nucleus as our vaccum. Experimental results are compatible with the corresponding theoretical estimates.

3946 **(IFUSP-P—302) Multiple Coulomb excitation effects in heavy ion compound and fusion cross sections.** Carlson, B.V.; Hussein, M.S. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1981. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704284.

A simple model for the average S-matrix that describes heavy ion direct processes in the presence of absorption due to compound nucleus formation is developed. The fluctuation cross section and the fusion cross section are then calculated for deformed heavy ion systems where multiple Coulomb excitation is important. A simple expression for the fusion cross section valid for above-barrier energies is then obtained. The formula clearly displays the modification due to Coulomb excitation in the usual geometrical expression.

3947 **(IFUSP-P—304) Energetics of the Gamow-Teller resonances.** Nakayama, K.; Galeao, A.P.N.R.; Krmpotic, F. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1981. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704285.

It is suggested that the energy difference between the Gamow-Teller and Fermi resonances is given, in units of MeV, by E sub(GT) - E sub(F) = 26A sup(-1/3) - 18.5 (N-Z)/A. The consequences of this result on the strength of the spin and isospin dependent residual interaction, as well as on the effective axial-vector coupling constant, are discussed.

3948 **(IFUSP-P—313) Optical theorem and forward glory effects in heavy-ion scattering.** Hussein, M.S.; Nussenzveig, H.M.; Villari, A.C.C.; Cardoso Junior, J.L. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704282.

A detailed discussion of the optical theorem for heavy-ion scattering is given. It is pointed out that a careful application of this theorem to light heavy-ion systems may yield information about the nuclear interaction at distances corresponding to forward glory trajectories. Applications to several cases are presented.

3949 (INIS-SU—180, pp 121-128) **Deep inelastic lepton-nuclear interactions.** Garsevanishvili, V.R.; Darbaidze, Ya.Z.; Menteshashvili, Z.R.; Ehsakiya, Sh.M. 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).
Portions are illegible in microfiche products7 refs.

The problem of building relativistic theory of nuclear reactions by way of involving relativistic methods, developed in the elementary particle theory, becomes rather actual at the time being. The paper presents some results of investigations into deep inelastic lepton-nuclear processes lA → l'(A-1)x, with the spectator nucleus-fragment in the finite state. To describe the reactions lA → l'(A-1)x (where l=an electron, muan, neutrino, antineutrino), the use is made of the self-similarity principle and multiparticle quasipotential formalism in the "light front" variables. The expressions are obtained for the differential cross-sections of lepton-nuclear processes and for the structure functions of deep inelastic scattering of neutrinos (antineutrinos) and charged leptons by nuclei.

3950 **(IPNO-TH—83-01) Remarkable properties of the broken pair model 2 relation with the quasi-particle scheme.** Lorazo, B.; Quesne, C. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Jan 1983. 26p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700004.

A non-spurious quasi-particle scheme is presented, its number-projection being exactly the broken-pair model. From this property, quantities needed in the broken-pair approach are easily evaluated by making use of the extreme simplicity of the quasi-particle algebra. Applications to the Hamiltonian operator and to one-body operators are presented for seniority v=0, 1 and 2.

3951 **(IPNO-TH—83-04) Nuclear excitations in the nuclear response theory.** Nguyen Van Giai. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1983. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700065.

The Random Phase Approximation is used to calculate the response of a nucleus to an external field. The method allows a full treatment of continuum effects. Effective interactions to be used are discussed, and the consistency between the mean field and the residual interaction is stressed. Some applications to excitation properties of spherical nuclei are shown.

3952 **(JAERI-M—82-128) Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT.** Hasegawa, Akira; Narita, Tsutomu. (Japan Atomic Energy Research Inst., Tokyo). Sep 1982. 52p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE84700078.

In order to improve the current situation for production of group cross-section set, we performed intercomparison of energy dependent cross-section generation codes, i.e. RESEND, RESENDD and RECENT which are currently used in the nuclear data community. And also the results were contributed to the international comparisons of energy dependent cross-section generation codes, organized by Dr. Cullen of IAEA. The ENDF/B V dosimetry file (Vol 531 tape) is adopted as the common input data file. We calculated cold (i.e. 0.0 Kelvin) energy dependent point-wise cross-sections and also calculated unshielded group averages in the 620 group SAND-II structures for the convenience of comparisons. Through this assessment, we can not recommend to use the official version of RESEND code at all due to the erroneous cross-section generation for partial reaction cross-sections (other than total reaction) in the resolved resonance region and also for the cross-sections in the unresolved region. And for RESENDD code, it has problems following three points: 1) process error in the constant background cross section treatment in file-3 given by interpolation scheme 1, 2) insufficient data points generation in resolved resonance range for very narrow resonances, this affects resonance integrals by several tens percent overestimation for the worst case, 3) violating the process criteria in unresolved resonance range, in this range cross-sections other than the tabulated energies should be defined by interpolating the generated cross-sections at the tabulated energies (not the unresolved parameters). Hence, at present stage, we recommend to use RECENT code to generate energy dependent point-wise cross-sections.

3953 **(JINR—E-4-82-693) Short-range correlations in an extended time-dependent mean-field theory.** Madler, P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704286.

A generalization is performed of the time-dependent mean-field theory by an explicit inclusion of strong short-range correlations on a level of microscopic reversibility relating them to realistic nucleon-nucleon forces. Invoking a least action principle for correlated trial wave functions, equations of motion for the correlation functions and the single-particle model wave function are derived in lowest order of the FAHT cluster expansion. Higher order effects as well as long-range correlations are considered only to the extent to which they contribute to the mean field via a readjusted phenomenological effective two-body interaction. The corresponding correlated stationary problem is investigated and appropriate initial conditions to describe a heavy ion reaction are proposed. The single particle density matrix is evaluated.

3954 **(WIS-PH—83/21) Phenomenology of shape transitions in hot nuclei.** Levit, S.; Alhassid, Y.; Wright, A.W. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics). May 1983. 64p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE84700069.

Phenomenological description of the temperature-driven shape transitions in heavy nuclei is presented. The general framework of the Landau theory is used to establish the free energy and entropy dependence on the deformation and the temperature-energy variables. This information is used to discuss the equilibrium quantities as well as the fluctuation effects around equilibrium shapes. Calculations are presented for the entropy, energy and the level density in the context of a typical example of a heavy nucleus undergoing shape transition. The results show considerable deviations from the standard dependences which are obtained using the assumption of a fixed nuclear shape.

3955 **(ZfK—498) Phase transitions in nuclear matter and consequences for neutron stars.** Kaempfer, B. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Apr 1983. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700070.

Estimates of the minimal bombarding energy necessary to reach the quark gluon phase in heavy ion collisions are presented within a hydrodynamical scenario. Further, the consequences of first-order phase transitions from nuclear/neutron matter to pion-condensed matter or quark matter are discussed for neutron stars.

3956 **Predictions of the interacting boson approximation in a consistent Q framework.** Warner, D.D.; Casten, R.F. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 4, 1798-1806(Oct 1983). Contract AC02-76CH00016.

The predictions of the interacting boson approximation are studied in the consistent Q formalism in which the same parametrization of the boson quadrupole operator is used in both the Hamiltonian and in the E2 operator. In this scheme, wave functions, relative energies of states of the same spin, and all relative B(E2) values depend on only a single parameter, chi/sub Q/, which appears in the internal structure of the operator Q. This feature allows a number of simple results to be obtained, principally through the

construction of contour plots of various observables in terms of chi/sub Q/ and the boson number N. The entire SU(3)—O(6) region, including both limiting symmetries, can be treated by allowing chi/sub Q/ to vary between its respective limiting values for those two symmetries. For deformed nuclei, a number of characteristic features are obtained, involving the predicted decay of the $\gamma$ band and the energy and decay of the first $0^+$ excitation. It is shown that the dominance of the $\beta \rightarrow \gamma$ over $\beta \rightarrow g$ matrix elements and the near equality of $\beta \rightarrow \gamma$ and $\gamma \rightarrow g$ E2 matrix elements are inherent features of the model. The automatic inclusion of band mixing in the interacting boson approximation is discussed in terms of the mixing parameter Z/sub $\gamma$/ and it is shown that the interacting boson approximation reproduces the empirical systematics in Z/sub $\gamma$/. The concepts of the intrinsic state formalism are reviewed in the context of the consistent Q framework and shown to imply vanishing $\beta \rightarrow g$ transitions, for any boson number, in the absence of K mixing effects.

3957 **Effect of dissipation on the eigensolutions near the fission saddle point.** Davies, K.T.R.; Nix, J.R.; Sierk, A.J. (Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] C: Nuclear Physics;* **28**: No. 3, 1181-1187(Sep 1983).

Two equivalent methods are developed for solving the problem of small oscillations near equilibrium when dissipative forces are included in the dynamical equations of motion. One method relies on the Lagrangian formulation of the equations of motion, and the other method relies on the Hamiltonian formulation. The eigenvalues are in general complex, but for unstable or overdamped motion they are purely real. We use the Lagrangian formulation to calculate the two lowest symmetric eigensolutions at the fission saddle point for nuclei with $Z^2/A$ ranging from 18.0 to 44.6 for ordinary two-body viscosity, one-body wall-formula dissipation, and one-body wall-and-window dissipation.

3958 **Calculations of pion excess in nuclei.** Friman, B.L.; Pandharipande, V.R.; Wiringa, R.B. (Department of Physics, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *Physical Review Letters;* **51**: No. 9, 763-766(29 Aug 1983). Contract W-31-109-ENG-38.

The authors construct, in the static potential approximation, the number operator for excess pions present in nuclei due to the pion-exchange forces between nucleons. Expectation values are calculated with use of variational wave functions obtained from a realistic Hamiltonian. Results are presented for systems ranging from the deuteron to nuclear matter: For example $^{56}$Fe is estimated to have ~7 extra pions, over and above the pion clouds associated with the individual nucleons.

3959 **Nonlinear mean field theory for nuclear matter and surface properties.** Boguta, J. (Lawrence Berkely Lab., CA (USA)); Moszkowski, S.A. (California Univ., Los Angeles (USA)). *Nuclear Physics [Section] A;* **403**: No. 3, 445-468(25 Jul 1983).

Nuclear matter properties are studied in a nonlinear relativistic mean field theory. We determine the parameters of the model from bulk properties of symmetric nuclear matter and a reasonable value of the effective mass. In this work, we stress the nonrelativistic limit of the theory which is essentially equivalent to a Skyrme hamiltonian, and we show that most of the results can be obtained, to a good approximation, analytically. The strength of the required parameters is determined from the binding energy and density of nuclear matter and the effective nucleon mass. For realistic values of the parameters, the nonrelativistic approximation turns out to be quite satisfactory. Using reasonable values of the parameters, we can account for other key properties of nuclei, such as the spin-orbit coupling, surface energy, and diffuseness of the nuclear surface. Also the energy dependence of the nucleon-nucleus optical model is accounted for reasonably well except near the Fermi surface. It is found, in agreement with empirical results, that the Landau parameter $F_0$ is quite small in normal nuclear matter. Both density dependence and momentum dependence of the NN interaction, but especially the former, are important for nuclear saturation. The required scalar and vector coupling constants agree fairly well with those obtained from analyses of NN scattering phase shifts with one-boson-exchange models. The mean field theory provides a semiquantitative justification for the weak Skyrme interaction in odd states. The strength of the required nonlinear term is roughly consistent with that derived using a new version of the chiral mean field theory in which the vector mass as well as the nucleon mass is generated by the sigma-field.

3960 **Simplified equation of state near nuclear density.** Bethe, H.A. (California Inst. of Tech., Pasadena (USA). W.K. Kellogg Radiation Lab.); Brown, G.E.; Cooperstein, J. (State Univ. of New York, Stony Brook (USA). Dept. of Physics); Wilson, J.R. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Physics [Section] A;* **403**: No. 3, 625-648(25 Jul 1983).

The equation of state near nuclear density influences shock formation in stellar collapse supernovae. The drop in the adiabatic index below 4/3 in this region, due to the negative nuclear pressure, disturbs the homology of the inner core and decreases its size. The initial shock energy and formation dynamics are particularly sensitive to matter in this regime. Only matter at low entropies ($S <= 1.5$) in the unshocked inner core approaches nuclear densities. We derive a simple equation of state for this material and find that nuclear properties are close to those at $S = 0$. The entropy associated with the nuclear surface can be absorbed into an 'effective mass' which decreases towards one with increasing density, giving an accurate accounting for the storage of entropy in the excitation of the large nuclei. Such thermal excitation drains energy with little contribution to the pressure and thus may have important effects on the launching of the shock. Two phase transitions are considered. The first, from the heavy nucleus to the 'bubble' phase, occurs at half nuclear matter density and is accomplished by use of simple expressions for the energy and pressure that include effects of the transition implicitly. The second, that to uniform nuclear matter, is done by requiring continuity of the pressure and entropy at the transition. The density at which this transition takes place is calculated and is found to decrease with entropy in a simple manner. With the use of suitable approximations, the equation of state is presented in a non-iterative form easily adapted for use in full hydrodynamical calculations of the supernovae process. Comparison with more detailed equations of state is made and the simplified one is found to represent well all important features.

3961 **Single-particle Glauber matrix elements.** Oset, E.; Strottman, D. (Departamento de Fisica Atomica y Nuclear, Universidad de Valladolid, Valladolid, Spain). *Atomic Data and Nuclear Data Tables;* **28**: No. 3, 531-555(May 1983).

The single-particle matrix elements of the Glauber profile function are tabulated for harmonic oscillator single-particle wave functions. The tables are presented in such a manner as to be applicable if the hadron—nucleon elementary scattering amplitude is specified by either a partial wave expansion or a Gaussian in momentum transfer squared. The table is complete through the 1 g/sub 9/2/ orbital and contains entries for the 3s/sub 1/2/ orbital for use if realistic wave functions are expanded in terms of harmonic oscillator functions.

3962 **Damping of nuclear excitations.** Bertsch, G.F.; Bortignon, P.F.; Broglia, R.A. (National Superconducting Cyclotron Laboratory and Department of Physics, Michigan State University, East Lansing, Michigan 48824). *Reviews of Modern Physics;* **55**: No. 1, 287-314(Jan 1983). Contract W-7405-ENG-26.

The authors review the theory and the empirical evidence of damping of simple nuclear excitations. The excitations considered are the particle states and vibrational states. The particle damping phenomena include the fragmentation of single-particle levels, the systematics of neutron strength functions, and the optical absorption of elastic scattering. Information on the known collective vibrational states is summarized and compared with theory. A theoretical model that has found considerable success is based on a damping mechanism in which the simple excitations mix with the surface vibrations. This implies that the surface damping dominates for excitation energies below about 15 MeV. There is a close relation between the single-particle damping and the damping of collective vibrations. However, the vibrational damping is strongly suppressed by the coherence between the particle and the hole. While

the model reproduces many of the observed features of the data rather well, it tends to underpredict the spreading width by as much as a factor of 2. Thus other degrees of freedom, not well understood at present, may play a role in the damping.

3963 **Path integral theory and deep inelastic scattering of nuclei.** Neto, J.L. Oxford, England; Oxford University (1981). 127p. Available from British Library, Boston Spa, Wetherby, West Yorks. No. D44229/83.

A formalism, based on Feynman's path integral, is developed and used in the theory of deep inelastic collisions of nuclei. Having shown how to express the propagator of the Wigner function of an isolated system as a (double) path integral in phase space, random processes are considered and the influence functional in interacting systems is discussed. A semi-classical description for the reduced Wigner and a generalized Langevin equation are given. Finally, the formalism is used in a random matrix model for deep inelastic collisions.

## 6540 Radiation And Shielding Physics

*REFER ALSO TO CITATION(S) 2863, 3566, 3976, 4141, 4171*

3964 **(AWRE—018/82) Calculation of the shielding effect of solid shell enclosures.** Garthwaite, F.G.L. (Ministry of Defence, Aldermaston (UK). Atomic Weapons Research Establishment). Apr 1983. 26p. HMSO, London, price Pound 1.50.

A computer code has been written to determine the shielding effect of solid-shell enclosures against EMP. It is based on the work of Kaden and Sevat. Kaden solved Maxwell's equations and derived the transfer functions for a sphere, a cylinder in an axial magnetic field and a cylinder in a transverse magnetic field. In most practical cases of shielding one of these basic shapes can be used. Sevat modified the transfer functions to allow the use of a computer and gave a set of curves which can be used to calculate the shielding effect of enclosures. For this program the shield characteristics (permeability and conductivity), the basic model and the dimensions of the model are all the data needed. A standard field pulse is incorporated in the model but the pulse parameters can be changed. Graphs of the external field pulse within the enclosure and the shielding efficiency are plotted by the program. Two sets of results are given, one for tinned iron shield and one for a copper shield, using a sphere to approximate the basic shape of the enclosures.

3965 **(EFI—514(1)-82) Phenomenon of the minimum of radiation energy losses of relativistic electrons in the crystal.** Avakyan, A.P.; Glebov, V.I.; Zhevago, N.K. Yan Shi. (Erevanskij Fizicheskij Inst. (USSR)). 1982. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703984.

A numerical solution is given of the problem on the integral radiation energy loss of relativistic electrons in the crystal in the approximation of the averaged potential of atomic chains (axes) taking into account all the crystal axes. The radiation energy loss of the electrons is found to take a minimum value when the electron inlet angle THETA$_0$ into the crystal with respect to axes tends to the critical Lindhard angle THETAsub(L)sup((S)) for axis channeling. This minimum is shown to be due to the fact that in the transition region from the axis channeling to the plane one, the fraction of particles accomplishing overbarrier motion and having noticeably less energy radiation loss, considerably increases.

3966 **(FEI—1282) Investigation of neutron kinetics in the nanosecond range in a depleted uranium sphere.** Romanov, V.M.; Makarov, O.I.; Matusevich, E.S.; Demenkov, V.G.; Zajtsev, M.Yu. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700061.

Using a muniature pulsed ionization fission chamber employing a layer of $^{252}$Cf and positioned in the centre of a sphere, 20 cm in dia., of depleted uranium, and also a neutron scintillation spectrometer with an organic crystal, measurements were taken of the neutron flux density on the sphere surface as a function of time in the range of $5x10^{-9}$ s to $150x10^{-9}$ s for the energy ranging between 0.175 MeV and 10.5 MeV. The exponential drop in a limited time interval is shown to exist. The attenuation decrement in this case depends on the neutron threshold energy and varies from $8x10^{7}$ s$^{-1}$ to $3.2x10^{8}$ s$^{-1}$. The experimental results are compared with the calculation performed to a 26-group diffusion approximation.

3967 **(IAE—3468/6) Distributions of accelerated ion ranges. Helium and lithium isotopes.** Burenkov, A.F.; Zhukova, T.I.; Komarov, F.F.; Kumakhov, M.A.; Temkin, M.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 60p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703986.

The calculation results of distribution profiles, elastic and inelastic losses of $^{3}$He, $^{4}$He, $^{6}$Li, $^{7}$Li ions in thirteen metallic targets and silicon are presented.

3968 **(JAERI-M—82-118) Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials.** Yamaguchi, Sadae; Sugizaki, Yasuaki; Ozawa, Kunio; Nakai, Yohta. (Japan Atomic Energy Research Inst., Tokyo). Aug 1982. 77p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE84700010.

This report presents a compilation of the experimental data on trapping and re-emission of energetic hydrogen isotopes and helium in materials. A survey has been made of the literatures up to end of 1980, by dividing it into following seven sections: 1) Dose Dependence, 2) Target Material Dependence, 3) Time Dependence, 4) Target Temperature Dependence, 5) Incident Energy Dependence, 6) Damage Effects, 7) Ion-Induced Release. The experimental data for helium, however, is cited only in limited cases, because of the lack of experiments.

3969 **(JAERI-M—82-130) Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct.** Tanaka, Shun-ichi; Oyama, Yukio; Sasamoto, Nobuo; Nakamura, Tomoo. (Japan Atomic Energy Research Inst., Tokyo). Sep 1982. 45p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700062.

A streaming experiment was carried out to examine the behavior of D-T neutrons and secondary gamma rays in a concrete bent duct constructed as a personnel access way in the Fusion Neutronics Source Facility (FNS). The distributions in the duct were measured for neutron and gamma-ray dose equivalents, fast neutron dose, and thermal neutron flux. The energy spectra of fast neutrons and gamma rays were also measured at four positions in the duct. This report describes in detail the experimental technique, the measured data as well as the experimental conditions such as the configuration and the composition of the structural materials and the source conditions which are essential for the analysis of the measurements.

3970 (LA—9798-P, pp 401-402) **$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals.** Maier, K. (Universitaet Stuttgart, Germany); Seeger, A. Jun 1983. NTIS, PC A19/MF A01.

In Physics with LAMPF II.

Lattice-steering (channeling) experiments, involving the implantation of positive kaons, pions, or muons, allow the determination of the crystal site preferred by the implanted particle. Interstitial electrostatic potentials and light interstitial diffusion information can therefore be obtained. LAMPF II could provide an excellent source of these particles for studies of considerable interest to materials science.

3971 **(SAND—83-1409C) Radiation-enhanced diffusion in ion-implanted glasses and glass/metal couples.** Arnold, G.W. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 6p. (CONF-831174—8). NTIS, PC A02/MF A01. Order Number DE84002802.

From Materials Research Society annual meeting; Boston, MA, USA (14 Nov 1983).

Ion implantation causes alkali migration to the surface in alkali silicate glasses. Rutherford backscattering spectrometry was used to follow this depletion. Room temperature implantations of 5 x $10^{16}$ 250 keV Xe/$cm^2$ in $12M_2O.88SiO_2$ (M = Li, Na, K, Rb, Cs) removes approximately equal numbers (within a factor of 2) of alkali from the glass. Low temperature (77K) implants significantly reduce the alkali loss. These results imply a radiation-enhanced diffusion mechanism in which the alkali interchanges with the products of the collision cascade, with the kinetics being limited by the radiation damage components. The results for mixed-alkali glasses ($(12-x)M_2O.xCs_20.88SiO_2$) give further evidence for this process. In glass/metal couples, radiation enhanced diffusion allows the interchange of glass network components with deposited metals. Rutherford backscattering spectrometry was used to follow the interchange of silicate and phosphate glass components with metal ions near the heavy-ion implanted interface between glass substrate and metal (Al,Zr) films.

3972 **Recent muon fluence measurements at Fermilab.** Cossairt, J.D. (Fermilab, Batavia, IL). *Health Physics;* **45**: No. 3, 651-658(Sep 1983).

Muon fields at Fermilab were measured during 1980-1981 using a Mobile Environmental Radiation Laboratory (MERL). During the spring of 1980, measurements were made with the accelerator operating at 350 GeV; in the spring of 1981, measurements were made at 400 GeV. The measurements were used to obtain an understanding of muon dose-equivalent rates at various locations both on and off the Fermilab site. These were found to be less than 1 mrem/yr at any given location. The data indicate that more severe problems may be encountered during operations of the 1000 GeV accelerator presently being installed.

3973 **Position-dependent stopping power for channeled ions.** Crawford, O.H.; Nestor, C.W. Jr. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1260-1266(Sep 1983). Contract W-7405-ENG-26.

A method is developed for predicting the stopping power of crystals toward swift channeled ions, based on a semiempirical treatment of the dielectric response of the medium. Random stopping power is also obtained. Theoretical results are compared with the experimental channeled stopping power of gold as a function of ion velocity and position within channels. It is shown that the theory is accurate when the velocity of the ion equals at least twice the root-mean-square velocity (estimated from binding energies) of most of the electrons near its path.

3974 **Time-dependent scattering in resonance lines.** Kunasz, P.B. (Lawrence Livermore National Laboratory). *Astrophysical Journal;* **271**: No. 1, 321-334(1 Aug 1983).

A numerical finite-difference method is presented for the problem of time-dependent line transfer in a finite slab in which material density is sufficiently low that the time of flight between scatterings greatly exceeds the relaxation time of the upper state of the scattering transition. The medium is assumed to scatter photons isotropically, with complete frequency redistribution. Numerical solutions are presented for a homogeneous, time-independent slab illuminated by an externally imposed radiation field which enters the slab at t = 0. Graphical results illustrate relaxation to steady state of trapped internal radiation, emergent energy, and emergent profiles. A review of the literature is also given in which the time-dependent line transfer problem is discussed in the context of recent analytical work.

3975 **Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO).** Howard, J.; Tomkinson, J.; Eckert, J.; Goldstone, J.A.; Taylor, A.D. (University of Durham, Chemistry Department, Durham DH1 3LE, United Kingdom). *Journal of Chemical Physics;* **78**: No. 6, 3150-3155(15 Mar 1983).

Inelastic neutron scattering spectra of several complexes {potassium hydrogen maleate, nickel dimethylglyoxime, and tripotassium cis-dichloro (hydrogen disulfito) and tripotassium cis-dichloro (hydrogen disulfito) platinate (II)} with strong intramolecular hydrogen bonds have been obtained and the out-of-plane bending modes γ(OHO) of the hydrogen bond assigned. Using previously published data, primarily for intermolecularly hydrogen bonded complexes, it is shown that as the oxygen—oxgyen distance {R(OO)} decreases γ(OHO) increases. Our new data do not follow this correlation since γ(OHO) is also observed to decrease as R(OO) decreases. It is suggested that this observation is due not to a fundamental difference in the behavior of inter- and intramolecular hydrogen bonds but rather to the different range of values of R(OO) found for each type. For the intermolecular systems R(OO) is greater than ~ 2.44 A, while for the intramolecular complexes (including potassium monochloromaleate) R(OO) is less than this value. It appears that hydrogen bonds undergo a change in dynamic properties at R(OO) 2.44 A and some geometric properties of ring systems are discussed which support this idea.

3976 **Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982.** Greenberg, W.; Zweifel, P.F. (Laboratory for Transport Theory and Statistical Physics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061). *Transport Theory and Statistical Physics;* **12**: No. 1, 85-101(Jan 1983). Contract AS05-80ER10711.

A review of reports presented at the third Oberwolfach Conference is given. Existence proofs of solutions to the nonlinear Boltzmann equation drew the most attention. Also discussed were chaotic systems and the Vlasov problem. (AIP)

3977 **Ion channeling techniques for defect and surface studies.** Appleton, B.R. (Oak Ridge National Lab., TN). pp 97-115 of Defects in semiconductors. Narayan; Tan (eds.). Amsterdam, Netherlands; North-Holland, Inc. (1981). Contract W-7405-ENG-26.

The channeling and blocking phenomena are well enough understood that they can be combined with ion scattering or ion induced reactions to investigate defects and surface structures. A brief review is given of the origins of these phenomena, of associated concepts which are useful for defect and surface analysis, and of experimental constraints and requirements. Applications to selected problems are used to illustrate the advantages and limitations of these techniques.

3978 **Calculation of stray dose distributions of gamma and X radiation in homogeneous and inhomogeneous media by means of Monte-Carlo methods.** Sadat-Khonsari, A. Berlin, Germany; Freie University (1981). 89p. (In German). Available from the library of Freie Univ. Berlin (Germany, F.R.).

The dose distributions for photon radiations up to 1.25 MeV may be determined accounting for the photoelectric and the Compton effect alone. The calculations were made for discrete energy values between 50 keV and 1.25 MeV for a water-equivalent half space. For determination of the influence of the scattering medium on the stray dose distribution the Monte-Carlo calculation was performed for Al as the absorbing medium.

## 6550 Medical Physics

*REFER ALSO TO CITATION(S) 4246*

3979 **(GSF-S—885) Calculation of dose from external photon exposures using reference human phantoms and Monte-Carlo methods. Pt. 1.** Kramer, R.; Zankl, M.; Williams, G.; Drexler, G. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)). Dec 1982. 75p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751351.

By the help of a Monte-Carlo program the dose that single organs, organ groups and bigger or smaller parts of body would receive on an average, caused by an irradiation definitely fixed by the geometry of irradiation and photon energy, can be determined. Thus the phantom in connection with the Monte-Carlo program can be used for several considerations as for example - calculation of dose from occupational exposures - calculation of dose from diagnostic procedures - calculation of dose from radiotherapy procedures.

3980 **(ORNL/TM—8697) 1982 US-CEC neutron personnel dosimetry intercomparison study.** Swaja, R.E.; Sims, C.S.; Greene, R.T.; Schraube, H.; Burger, G. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 78p. NTIS, PC A05/MF A01. Order Number DE84002975.

A neutron personnel dosimetry intercomparison study was conducted during April 19-23, 1982, as a joint effort between the United States and the Commission of European Communities. Dosimeters from 48 participating agencies were mounted on cylindrical phantoms and exposed to a range of low-level dose equivalents (0.48-13.91 mSv neutron and 0.02-1.32 mSv gamma) in nine different radiation fields. Exposure conditions considered in this study included four mixed-field spectra produced using the Health Physics Research Reactor, four monoenergetic neutron fields generated by accelerators, and one 15-cm $D_2O$-moderated californium source spectrum. In general, neutron results reported by the participating agencies were consistent with expected dosimeter performance based on energy response characteristics of the detection systems. Albedo dosimeters, which were the most popular neutron monitoring systems used in this study, provided the best overall accuracy for all exposure conditions. Film, Cr-39 recoil track, and Th-232 fission track systems generally underestimated dose equivalents relative to reference values. Associated gamma measurements showed that TLD monitors produced more accurate results than film dosimeters although both systems overestimated gamma dose equivalents in mixed radiation fields. 24 references, 10 figures, 19 tables.

3981 **(UCRL—88041) Beta-dosimetry studies at LLNL.** Hankins, D.E. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 21p. (CONF-830204—13). NTIS, PC A02/MF A01. Order Number DE84002792.

From International beta dosimetry symposium; Washington, DC, USA (15 Feb 1983).

Portions are illegible in microfiche products.

This paper summarizes three beta-dosimetry studies made recently at the Lawrence Livermore National Laboratory. The first study was to determine the beta-gamma exposure rates at the Los Alamos Godiva IV Critical Assembly. The beta spectra from the assembly were evaluated using absorption curves and the beta-gamma dose-rate ratios were determined at various distances from the assembly. A comparison was made of the doses determined using two types of TLD personnel dosimeters and a film badge. The readings of an Eberline RO-7 instrument and the dose rates determined by TLDs were compared. Shielding provided by various metals, gloves, and clothing were measured. The second study was to determine the beta energy response of the Eberline RO-7 instrument based on measurements made with the PTB beta sources. This study required additional calibration points for the PTB sources which were made using extrapolation chamber measurements. The third study resulted in two techniques to determine the beta energy (E/sub max/) from the readings of this-window portable survey instruments. Both techniques are based on the readings obtained using aluminium filters. One technique is for field application, requires one filter, and provides a quick estimate of the beta energy in three energy groups: $<$ 0.5 MeV, 0.5 MeV to 1.5 MeV and $>$ 1.5 MeV. The second technique is more complex requiring measurements with two or three filters, but gives the beta energy and the approximate shape of the beta spectrum. 9 references, 6 figures.

3982 **Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam.** Ten Haken, R.K.; Awschalom, M.; Rosenberg, I. (Fermilab Neutron Therapy Facility, Batavia, Illinois 60510). *Medical Physics;* **10**: No. 5, 636-641(Sep 1983).

The production of $^{11}C$, $^{13}N$, $^{15}O$ from C, N, O, and of $^{39}Cl$ and $^{41}Ar$ from Ar by a p(66)Be(49) clinical neutron therapy beam has been measured. The results of these measurements were used to estimate the production of other radionuclides, then to estimate airborne radioactivity in a typical neutron therapy room and radioactivity induced in body tissues during treatment. Only under special circumstances would airborne radioactivity necessitate a waiting period before entering a typical treatment room. The additional dose to a treatment volume due to decay products from radioactivity induced within that volume would amount to a few thousandths of the given dose and the additional body dose outside the treated volume would be a few millionths of the given dose.

3983 **American National Standard: neutron and gamma-ray flux-to-dose rate factors.** La Grange Park, IL; American Nuclear Society (1977). 15p. (ANSI/ANS—6.1.1-1977). American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525 $12.00.

This Standard presents data recommended for computing biological dose rates due to neutron and gamma-ray radiation fields. Neutron flux-to-dose-rate conversion factors for energies from 2.5 x $10^{-8}$ to 20 MeV are given; the energy range for the gamma-ray conversion factors is 0.01 to 15 MeV. Specifically, this Standard is intended for use by shield designers to calculate wholebody dose rates to radiation workers and the general public. Establishing dose-rate limits is outside the scope of this Standard. Use of this Standard in cases where the dose equivalents are far in excess of occupational exposure guidelines is not recommended.

## 6560 Solid State Physics

*REFER ALSO TO CITATION(S) 2731, 2732, 2823, 2963, 3507*

3984 **(INIS-BR—79) Proceedings of the 1. Latin-American Colloquium of Surface Physics.** Majlis, N.; Anda, E.V.; Ure, J.E.; Selzer, S.; Lerner, E.; Koiller, B.; Costa, R.B. da. (Centro Latino Americano de Fisica, Rio de Janeiro (Brazil); Universidade Federal Fluminense, Niteroi (Brazil)). Oct 1981. 249p. (In Portuguese). (CONF-8012117—). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83704381.

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Several physical properties are discussed, reviewed and presented from studies in metal, liquid and solid surfaces. The adsorption effect is studied for a series of experimental and theoretical configurations. Experimental devices are also shown.

3985 (INIS-BR—79, pp 33-44) **Single atom and-molecules chemisorption on solid surfaces.** Anda, E.V.; Ure, J.E.; Majlis, N. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A simplified model for the microscopic interpretation of single atom and molecules chemisorption on metallic surfaces is presented. An appropriated hamiltonian for this problem is resolved, through the Green's function formalism. (L.C.).

3986 (INIS-BR—79, pp 71-74) **Analysis of the phonon surface specific heat using Green function techniques.** Silva Carrico, A. da; Albuquerque, E.L. de (Rio Grande do Norte Univ., Natal (Brazil). Dept. de Fisica). Oct 1981. NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

Green functions are derived for the displacement associated with acoustic vibrations in isotropic elastic media and used to evaluate the surface specific heat in the harmonic approximation. Only the low-temperature limit case is considered since, provided K sub(B) T/h is very small, the dispersion relation for the three acoustic branches can be replaced by its long-wavelenght form. The contributions of surface elastic waves of the Rayleigh and Love types are pointed out and their features discussed. The nature of the result and their relations to previous work in this field is also presented and discussed.

3987 (INIS-BR—79, pp 223) **Brillouin scattering theory by bending in rough surfaces.** Khater, A.F. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).
Published in summary form only.

3988 (INIS-BR—79, pp 231) **Use of the transfer matrix in the calculation of surface spectral densities.** Cabrera, G.G. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).
Published in summary form only.

3989 (INIS-BR—79, pp 183-186) **Light scattering by surface phonons in crystals.** Albuquerque, E.L. de (Rio Grande do Norte Univ., Natal (Brazil). Dept. de Fisica Teorica e Experimental). Oct 1981. NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

A theory of inelastic light scattering by surface acoustic phonons in homogeneous crystals is presented. The Green functions are determined by the use of a classical linear response method and used to evaluate the Brillouin cross section. The acoustic modes are found from solutions to the acoustical-wave equation and boundary conditions appropriated. Two light-scattering mechanisms, namely the surface corrugation and bulk elasto-optic effect are analyzed by deriving optical fields which satisfy both the acousto-optically driven wave equation and the electromagnetic boundary conditions. No restrictions are imposed concerning the angle of incidence of the light. Some representative computed Brillouin lineshapes are also presented and their features discussed.

3990 (INIS-mf—7727, pp 40-45) **Mechanism of piezo - and pyroelectricity of poly (vinylidene fluoride) electret.** Wada, Y. (Tokyo Univ. (Japan). Faculty of Engineering). Oct 1980. NTIS (US Sales Only), PC A16/MF A01. (CONF-8010267—).

From 2. Japan-Brasil symposium on science and technology; Rio de Janeiro, Brazil (13 Oct 1980).

Basic concepts of the piezo - and pyroelectricity theory of polymer electrets are given. The origins of these effects are presented. The piezo - and pyroelectric constants are numerically obtained.

3991 **Nonlinear saturation of Rayleigh—Taylor instability in thin films.** Babchin, A.J.; Frenkel, A.L.; Levich, B.G.; Sivashinsky, G.I. (Institute of Applied Chemical Physics, The City College of The City University of New York, New York, New York 10031). *Physics of Fluids;* **26**: No. 11, 3159-3161(Nov 1983). Contract AC02-80ER10559.

A general mechanism of nonlinear saturation of instabiities in flowing films is described using the Rayleigh—Taylor instability as an example. The combined action of flow shear and surface tension is the essence of the saturation mechanism. As a result, the streamwise perturbations of the interface that would rupture a stagnant film do not rupture a film flowing in a certain range of shear rates.

3992 **Floating phase in the chiral Potts model. A Monte Carlo renormalization-group analysis.** Houlrik, J.M.; Jensen, S.J.K.; Bak, P. (Department of Physical Chemistry, Chemical Institute, Aarhus University, Aarhus, Denmark). *Physical Review* [*Section*] *B: Condensed Matter;* **28**: No. 5, 2883-2885(1 Sep 1983). Contract AC02-76CH00016.

Layers of atoms or molecules adsorbed on surfaces may exhibit floating critical phases. To investigate this phenomenon we have developed a Monte Carlo renormalization-group scheme and performed calculations on the three-state chiral clock model. The results indicate a continuous transition from a floating phase to a liquid phase at a temperature much higher than that found by series-expansion methods.

3993 **Monte Carlo simulation study of the two-dimensional melting mechanism.** Allen, M.P.; Frenkel, D.; Gignac, W.; McTague, J.P. (Department of Chemistry, University of California, Los Angeles, California 90024). *Journal of Chemical Physics;* **78**: No. 6, 4206-4222(15 Mar 1983).

We report here a Monte Carlo study of the thermodynamic and structural properties of a two-dimensional system of 2500 particles interacting by a repulsive inverse sixth power potential. Particular effort was made in the melting region, both to identify the defect structures and to ascertain the thermodynamic changes associated with the transition. Significant precursor fluctuations occurred on both the solid and fluid sides, and the unbinding of dislocation pairs was observed on melting. More complex defect patterns, including grain boundary loops, were also generated near melting. The Kosterlitz—Thouless, Halperin—Nelson, and Young dimensionless elastic constant approached the universal value $16\pi$ in the solid, and the orientational correlation range tended to diverge in the fluid near freezing. However, we were unable to distinguish between a very weak ($\Delta V/V \approx 0.7\%$) first order and a continuous transition, since both spatial structures and temporal relaxations became exceedingly long.

3994 **Surface contribution to the optical properties of nonlocal systems.** Mochan, W.L.; Fuchs, R.; Barrera, R.G. (Ames Laboratory—U.S. Department of Energy, Ames, Iowa 50011 and Department of Physics, Iowa State University, Ames, Iowa 50011). *Physical Review* [*Section*] *B: Condensed Matter;* **27**: No. 2, 771-780(15 Jan 1983).

A simple formalism is developed for the calculation of the optical properties of a nonlocal system, treating the continuous change of its response functions near the surface as a perturbation. The surface impedance is obtained in terms of the surface impedance of the unperturbed system and of the surface conductivity. The results are very general since no assumption about the unperturbed system is made, and it is shown that they include those of previous theories.

3995 **Chaos, periodic chaos, and the random-walk problem.** Kozak, J.J.; Musho, M.K.; Hatlee, M.D. (Department of Chemistry and Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana 46556). *Physical Review Letters;* **49**: No. 25, 1801-1804(20 Dec 1982).

The authors have studied whether numerically generated sequences from the logistic parabola f/sub b/(x) = 4bx(1-x) with b,xε[0,1], for values of b above the Feigenbaum critical value b/sub infinity/, are truly chaotic or whether they are periodic but with exceedingly large periods and very long transients. Using the logistic parabola the authors calculate via Monte Carlo simulation the average walk length for trapping on a one-dimensional lattice with a centrosymmetric trap. Comparison with exact results suggests that the only "truly chaotic" sequence is the one for which b = 1.

3996 **Resonance and pairing effects in the Anderson lattice.** Fedro, A.J. (Northern Illinois Univ., DeKalb); Sinha, S.K. pp 371-374 of Valence instabilities. Wachter, P.; Boppart, H. (eds.). New York, NY; North-Holland Publishing Company (1982).

We have calculated the one electron Green's functions for the Anderson lattice beyond Hubbard I by considering the equation of motion for the spin fluctuations arising from the large ($U = \infty$) correlation energy in a manner formally equivalent to that of Nagaoka in the Kondo impurity problem. This leads directly to frequency dependent self energy corrections yielding lifetime effects and, more importantly, a resonance in the f density of states at the Fermi energy, $\mu$, resulting in heavy Fermi liquid behavior for states near $\mu$, regardless of the position of the f level. In addition, at low temperatures, we find the formation of a highly coherent state, driven by the correlations, in which the f and conduction electrons undergo singlet pairing resulting in anomalies in specific heat and susceptibility.

3997 **Computer simulation of crack propagation: lattice trapping.** Paskin, A. (City Univ. of New York, Flushing); Som, D.K.; Dienes, G.J. *Journal of Physics C: Solid State Physics;* **14**: L171-L176(1981). Contract AC02-76CH00016.

Lattice trapping is an unexpected result obtained in a number of atomistic treatments of crack propagation. Molecular dynamic simulation was used in the present investigation to study crack behaviour. Using a large two-dimensional sample of about 11000 atoms and a relatively long-range Lennard-Jones potential,

lattice trapping is found to be a negligible effect. Sample size effects and the non-linearity of the modulus were studied and found not to affect the lattice trapping result. Negligible lattice trapping seems to be a consequence of the range of the potential; long-range continuous potentials produce negligible lattice trapping.

3998 **An estimate of the surface roughness effect.** Borie, B. (Oak Ridge National Lab., TN). *Journal of Applied Crystallography;* **14**: 219-222(1981). Contract W-7405-ENG-26.

A method for the computation of the effect of rough sample surfaces on diffraction intensities is described. Though the model used for the calculation is a special simple one, it is exact. The method is illustrated by its application to a surface whose boundary is a saw-tooth. Possible generalizations of the character of the surface roughness effect and how it depends on the dimensions of the surface irregularities are inferred from the calculation.

3999 **Chemical potentials in solids.** Nolfi, F.V. Jr. (Argonne National Lab., IL). *Scripta Metallurgica;* **14**: No. 12, 1323-1330(1980).

The purposes of this paper are: a) to provide a fundamental thermodynamic description of solids acted upon by nonhydrostatic and nonhomogeneous stresses, and b) to develop a self-consistent method of accounting for strain and volume changes in solids. Both amorphous and crystalline solids are considered in this paper.

## 6561 Superconductivity

*REFER ALSO TO CITATION(S) 2677, 2705, 2740, 2762, 2783, 2813, 2850, 3817*

4000 **(JINR—E-17-82-240) Microscopic model for superconductor with normal state nuclei.** Shumovsky, A.S.; Yukalov, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704004.

The microscopic model for two-liquid state in superconductors is constructed. It is shown that the existence of the stable normal component below the critical point is due to the competition between the effective attraction and Coulomb repulsion of electrons. The possibility of the nucleation phenomenon at the nonzero temperatures and the existence of a jump of the specific heat in the nucleation point are predicted. For the strong Coulomb repulsion the system is not purely superconducting even in the ground state.

4001 **Symmetry considerations for H/sub c/2 anisotropy experiments in cubic superconductors.** Sauerzopf, F.M.; Seidl, E.; Weber, H.W. (Atominstitut der Osterreichischen Universitaeten, Vienna, Austria). *Journal of Low Temperature Physics;* **49**: No. 3, 251-266(1 Nov 1982).

We report on an evaluation of H/sub c/2 anisotropy effects in arbitrary planes and directions of cubic superconductors. Using Mercator projections, information on the three-dimensional variation of H/sub c/2 is obtained. The results are discussed for the three main crystallographic planes of the cubic lattice and evaluated in terms of their usefulness for an accurate experimental determination of the anisotropy coefficients A/sub 1/. Although some planes show interesting features because of special symmetry conditions, we conclude that careful measurements in the (110) plane represents the optimum choice for an accurate determination of the anisotropy coefficients.

## 6570 Theoretical Physics

*REFER ALSO TO CITATION(S) 3118, 3476, 3845, 3987, 4034*

4002 **(CEA-CONF—6634) Sturm-Liouville spectrum problem: quartic oscillator case.** Voros, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Nov 1982. 10p. (In French). (CONF-8211123—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700001.

From Bourbaki seminar; Paris, France (20 Nov 1982).

The Sturm-Liouville eigenvalue problem given by the steady-state Schroedinger equation in quantum mechanics is considered on the real axis. There are, however, exact expressions available only for a harmonic oscillator (the Hermite equation); consequently, semi-classical asymptotic methods (in powers of the Planck's constant), which yield very good approximations, have been much studied analytically and as regards their relationships to geometrical optics. These methods relate the asymptotic form of the spectrum to the closed orbits of the Hamiltonian vector field of the function $H(p,q) = p^2 + V(q)$ in the phase space $R^2$. We seek to show that these supposedly approximate methods are in fact an exact way of solving the problem. The quartic oscillator, with $V(q) = q^4$, is used as an example.

4003 **(DOE/ER/03992—529) Fourier optics for the Maxwell field: formalism and applications.** Mukunda, N.; Simon, R.; Sudarshan, E.C.G. (Indian Inst. of Science, Bangalore. Centre for Theoretical Studies; Texas Univ., Austin (USA). Center for Particle Theory; Indian Inst. of Science, Bangalore. Dept. of Physics). Sep 1983. Contract AS05-76ER03992. 30p. NTIS, PC A03/MF A01. Order Number DE84002845.

The basic formalism for first order paraxial Fourier optics of the Maxwell field is established. Analysis of the relativistic symmetry of Maxwell's equations leads to specific mathematical quantities using which the passage from scalar to vector Fourier optics becomes unambiguous. The inconsistency of viewing scalar Fourier optics as the description of plane polarized Maxwell waves is recognized. System operators giving the actions of lenses, magnifiers, Fourier transformers and general first order systems on Maxwellian waves are constructed. Both field strength and vector potential treatments are given. Propagation of Gaussian beams is studied as an example. 20 references.

4004 **(DOE/ER/03992—530) Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields.** Simon, R.; Sudarshan, E.C.G.; Mukunda, N. (Indian Inst. of Science, Bangalore. Centre for Theoretical Studies; Texas Univ., Austin (USA). Center for Particle Theory; Indian Inst. of Science, Bangalore. Dept. of Physics). Sep 1983. Contract AS05-76ER03992. 15p. NTIS, PC A02/MF A01. Order Number DE84002844.

Propagation characteristics of Gaussian Schell model fields through first order optical systems and in free space are analyzed by the method of generalized rays. This allows the development of a simple geometrical description of these processes. The invariance of the degree of global coherence is established in full generality. Asymptotic behavior under free propagation and the emergence of a far zone universal structure are analyzed. New invariants associated with incoherent superpositions of such fields are found. 19 references.

4005 **(DOE/ER/03992—531) Realization of first order optical systems using thin lenses.** Sudarshan, E.C.G.; Mukunda, N.; Simon, R. (Texas Univ., Austin (USA). Center for Particle Theory; Indian Inst. of Science, Bangalore. Centre for Theoretical Studies; Indian Inst. of Science, Bangalore. Dept. of Physics). Sep 1983. Contract AS05-76ER03992. 18p. NTIS, PC A02/MF A01. Order Number DE84002848.

A first order optical system is investigated in full generality within the context of wave optics. We reduce the problem to a study of the ray transfer matrices. The simplest such systems correspond to axially symmetric propagation. Realization of such systems by centrally located lenses separated by finite distances is studied. It is shown that every axially symmetric first order system can be realized using at most three lenses. Among anisotropic systems it is proven that every symplectic ray transfer matrix, and no others, can be realized using lenses and free propagations. Suggestions for further study of the general first order system are outlined. 16 references.

4006 **(FEI—1308) Construction of Green functions by the additive operator splitting method.** Yuferov, A.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700002.

The construction of the Green functions by the additive splitting of operators is described. Examples of the Green function construction for evolution and one-velocity kinetic equations are given. The results obtained are the detailing and generalization of the known perturbation theory results of higher orders. However, here underlined is their applicability as universal means for the construction of the inverse operators - Green functions, but not only as means for determining corrections as this is interpreted in the perturbation theory.

4007 **(IAE—3611/12) To the theory of non-adiabatic transitions between degenerated states.** Likhanskij, V.V.; Solodovnikov, G.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700003.

Non-adiabatic transitions between degenerated states in a model of crossing of a parallel level system with one term were considered. Populations of sublevels in the finite state are completely determined with matrices of transitions between degenerated levels and phases of phi functions of the initial state. Expressions for transition probabilities averaged from random phases of the phi functions of the initial degenerated state have been obtained. Numerical calculations performed confirm completely analytical results in the given work.

4008 **(IFVE-OTF—82-56) Heisenberg operators of generalized Toda lattice.** Fedoseev, I.A.; Leznov, A.N.; Saveliev, M.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703980.

Exact solutions to Heisenberg equations of motion for generalized (finite, nonperiodic) Toda lattice are found in an explicit form. The perturbation expansion for dynamical operators of a certain kind reduces to finite polynomials over a coupling constant. This leads to an exact quantum description of the system.

4009 **(IFVE-OTF—82-162) Liouville supersymmetrical equation for a quantum case.** Leznov, A.N.; Khrushev, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703978.

The relation between coupling constants of interacting nonlinear scalar and spinor fields was established which leads to finite series of perturbation theory for the dynamical variable esup(-phi). In the classical limit $h/2\pi \to 0$ the system under consideration turns out to be described by supersymmetric Liouville equation.

4010 (INIS-BR—79, pp 179-181) **Time reversal theory in light scattering.** Oliveira, F.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Oct 1981. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. (CONF-8012117—).

From 1. Latin-American colloquium of surface physics; Niteroi, Brazil (1 Dec 1980).

The time reversal theory in light scattering by collective excitations in an insulator film is analyzed. The surface effect is included explicitly in order to improve the theory.

4011 **(INIS-BR—82) Equal-time commutation relations for non-abelian gauge field theories and Dirac brackets.** Girotti, H.O. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica). [nd]. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704378.

All meaningful Dirac brackets are computed, in the Coulomb gauge, for a SU(2) Yang-Mills field coupled with spin-1/2 field. The theory is quantized by abstracting the equal-time commutators from the corresponding Dirac brackets. Our results turn out to be in full agreement with those obtained by Schwinger through a significantly different method. Thus, the equivalence of both quantization schemes becomes reasonably established at the level of the operator formalism. The advantages of the quantization procedure mounted on the Dirac bracket formalism are discussed. The role played by the classical picture in the process of elaboration of the quantum dynamics becomes clarified.

4012 **(INIS-BR—83) Quantization of gauge invariant theories through the Dirac bracket formalism.** Costa, M.E.V.; Girotti, H.O. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica). [nd]. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704379.

A physical system possessing first class constraints is quantized by using the Dirac bracket formalism. The main features of this quantization procedure are analyzed. The model enable us to present a situation where gauge dependent Dirac brackets given origin to gauge independent equations of motion.

4013 (INIS-SU—180, pp 14-19) **Questions of phase transition and coupling constant renormalization in the interacting instanton gas.** Ilgenfritz, E.M.; Myuller-Preusker, M. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1981. NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

Properties of the Yang-Mills instanton gas give rise at least to two effects: a first order phase transition bag-to-vacuum driven by a classical external field and a non-perturbative renormalization of the coupling constant at large distances. The aim of the paper is to check both conjectures by considering the statistical mechanics of the interacting instanton gas. The consideration is based on the dilute gas approximation involving Gaussian integration over fluctuations around superpositions of instantons and antiinstantons. It is shown that the allowance for interactions does not qualitatively affect the instanton related rise of the $\beta$ function in the interpolation region. The existence of a mechanism restricting more drastically the length scale where instanton calculations can be applied is indicated.

4014 (INIS-SU—180, pp 48-52) **Application of Gegenbauer polynomial technique to 5-loop calculations in gphi$^4$ theory.** Kataev, A.L.; Tkachev, F.V.; Chetyrkin, K.G. 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

Gegenbauer polynomial technique is developed. It implies the calculation of multiloop Feynman integrals in massless theories. Anomalous dimension of a field $\gamma_2(g)$ is calculated in the five-loop approximation in a minimal subtraction scheme of the gphi$^4$-field model. The results obtained are used for determining O(epsilon$^5$)-order term in epsilon-expansion of a universal critical index eta which characterizes the behaviour of the correlation function near the point of a second order phase transition.

4015 (INIS-SU—180, pp 52-58) **Some results of the summation of constant sign asymptotic series of perturbation theory.** Kazakov, D.I. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The results are discussed of application of the earlier suggested technique of restoring a function from its constant-sign asymptotic expansion to two quantum physics problems: the determination of the ground energy level of an anharmonic oscillator With the twice-degenerate minimum and to construction of $\beta$-function of the renormalized group equation in the Yang-Mills theory. The technique, as applied to an explicitly solved problem, gave positive results.

4016 **(INIS-SU—180, pp 133-139) New approach to the calculation of multiloop Feynman diagrams: Gegenbauer polynomials technique in x space.** Kataev, A.L.; Tkachev, F.V.; Chetyrkin, K.G. 1981. (In Russian). NTIS (US Sales Only), PC AXX/MF A01. (CONF-8004233—).

From Seminar Quarks-80; Sukhumi, USSR (22 Apr 1980).

The technique is described for computing dimensional regularization of Feynman integrals that is based on the use of Gegenbauer polynomials in X-space. The technique permits to analytically compute the counterterms in any theory and for any composite operators at the threeloop level in the minimum subtraction circuit. An exact calculation is presented (in all orders for epsilon=(4-D)/2) for twoloop massless diagrams of a propagator type that occur in considerations of threeloop counterterms. The technique elaborated is applied to computation of threeloop corrections to the relationship $R(S)=\sigma\Xi sub(tot)(e^+e^- \rightarrow hadrons)/\sigma\Xi sub(tot)(e^+e^- \rightarrow \mu^+\mu^-)$ in QCD.

4017 **(IS—4815) Formulae for configuration averages of products of one-body and two-body operators in many-fermion spaces.** Margetan, F.J. (Ames Lab., IA (USA)). Nov 1982. Contract W-7405-ENG-82. 125p. NTIS, PC A06/MF A01. Order Number DE84002634.

Portions are illegible in microfiche products.

The trace reduction theorems (TRT) of J.N. Ginocchio and S. Ayik have greatly simplified the evaluation of the average expectation value of an operator in a basis of many-fermion states. Such averages are required for moment-method calculations of the statistical properties of many-fermion systems. The present work is aimed at simplifying the practical application of the TRT. Symmetries are used to detect distinct terms which have equal contributions to the operator average, and the minimum list of formulas which need be evaluated is presented. This is done for each product of one-body and two-body operators having four or fewer factors. The resulting formulas are applicable to both scalar average and configuration average calculations.

4018 **(ITEP—102(1982)) Generalized internal long wave equations: construction, hamiltonian structure and conservation laws.** Lebedev, D.R.; Radul, A.O. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703981.

Some aspects of the theory of the internal long-wave equations (ILW) are considered. A general class of the ILW type equations is constructed by means of the Zakharov-Shabat "dressing" method. Hamiltonian structure and infinite numbers of conservation laws are introduced. The considered equations are shown to be Hamiltonian in the so-called second Hamiltonian structure.

4019 **(JINR—R-11-82-670) Symbolic evaluation of some multidimensional integrals by the computer algebraic manipulations.** Zhidkov, E.P.; Lobanov, Yu.Yu. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703825.

A description of the elaborated computer program, written in SCHOONSCHIP, is given. The program is assigned for symbolic evaluation of some multidimensional non-own integrals, arising in the quantum field theory. The integrals may depend on some parameters. The problem of the evaluation of the considered integrals is reduced to the problem of the differentiation of some expressions. The obtaining of the derivatives of required order is carried out in the program by means of the recurrent relations. The evaluated integral as a function of the parameters becomes the result of the program run. Some examples of the use of the program, obtained by the CDC-6500 computer, are given.

4020 **(LA—9856-MS) Scattering and absorption of light by soot particles.** Suydam, B.R. (Los Alamos National Lab., NM (USA)). Sep 1983. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01. Order Number DE84002308.

We examine the structure of a particle of soot and construct a model of an average soot particle considered as a scatterer of light. Upon comparing two quite different models we conclude that the model chosen is not sensitive to details and ought therefore to be reliable. We find that, of the total extinction cross section, about 93 percent arises from absorption and only 7 percent from scattering. This greatly simplifies the calculation of light propagation through a cloud of such particles.

4021 **(UCRL—89397) Theory of pulse propagation in fluid-saturated porous layers.** Berryman, J.G.; Bonner, B.P.; Chin, R.C.Y.; Hedstrom, G.W. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 18p. (CONF-8310187—2). NTIS, PC A02/MF A01. Order Number DE84002714.

From IEEE ultrasonics symposium; Atlanta, GA, USA (31 Oct 1983).

We have developed a theory for ultrasonic pulses in a porous solid layer immersed in a fluid. Biot's mixture theory is used to describe the constitutive equation of a fluid saturated porous solid. Since fast and slow waves exist in a Biot solid, there is mode conversion at the interface even at normal incidence and, therefore, the transmission and reflection coefficients are 2 x 2 matrices. We use matrix methods in developing the solution of the wave propagation problem. A generalized ray expansion algorithm is obtained by using the Gauss-Seidel matrix iterative method. The arrivals of the fast and the slow waves are easily identified. A compact computational algorithm is developed using combinatorial analysis and the Cayley-Hamilton theorem. The computed solution is compared with Plona's experiment on pulses originating in water and striking normally at a porous disk. Good agreement between theory and experiment has been found.

4022 **(WIS-PH—83/16) Breakdown of maximality conjecture in continuous phase transitions.** Mukamel, D.; Jaric, M.V. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics). Apr 1983. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700012.

A Landau-Ginzburg-Wilson model associated with a single irreducible representation which exhibits an ordered phase whose symmetry group is not a maximal isotropy subgroup of the symmetry group of the disordered phase is constructed. This example disproves the maximality conjecture suggested in numerous previous studies. Below the (continuous) transition, the order parameter points along a direction which varies with the temperature and with the other parameters which define the model. An extension of the maximality conjecture to reducible representations was postulated in the context of Higgs symmetry breaking mechanism. Our model can also be extended to provide a counter example in these cases.

4023 **Broadband population inversion by phase modulated pulses.** Baum, J.; Tycko, R.; Pines, A. (Department of Chemistry and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **79**: No. 9, 4643-4644(1 Nov 1983).

We present a class of continuously phase modulated radiation pulses that result in coherent population inversion over a large range of transition frequencies. The continuously modulated pulses can be approximated by sequences of discrete phase shifted pulses. Simulations of the inversion properties of the continuously modulated pulses and of the discrete pulse sequences are given.

4024 **Thermoviscous effects on acoustic scattering by thermoelastic solid cylinders and spheres.** Lin, W.H.; Raptis, A. (Components Technology Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of the Acoustical Society of America;* **74**: No. 5, 1542-1554(Nov 1983).

This paper presents analytic solutions and numerical results of the scattering of plane sound waves from a thermoelastic circular cylinder and from a thermoelastic sphere in an infinite, thermoviscous fluid medium. The thermoelastic properties of the cylinder and the sphere and the viscosity and thermal conductivity of the surrounding fluid are taken into consideration in the solutions of the acoustic-scattering problems. We started with examining the acoustic field equations in thermoviscous fluids and in thermoelastic

solids from the standpoints of continuum mechanics and thermodynamics, and then presented the normal-mode solutions to, and numerical examples of, the acoustic scattering by a single cylinder and a sphere. The acoustic parameters of interest are the farfield scattering pattern, the acoustic-radiation force, and the absorption and scattering cross sections. These parameters were first derived in closed forms and then evaluated numerically for a given set of material properties.

4025 **Can the velocity autocorrelation function decay exponentially?.** Lee, M.H. (Department of Physics, The University of Georgia, Athens, Georgia 30602). *Physical Review Letters;* **51**: No. 14, 1227-1230(3 Oct 1983). Contract AS09-77ER01023.

For Hermitian many-body systems, admissible functions for the velocity autocorrelation function form a certain invariant of time. This property originates from a basic recurrence relation. The exponentially decaying function cannot form an invariant and therefore cannot be admissible.

4026 **Comparison of calculated and measured performance of diffused channel-waveguide couplers.** Feit, M.D.; Fleck, J.A. Jr.; McCaughan, L. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Journal of the Optical Society of America;* **73**: No. 10, 1296-1304(Oct 1983). Contract W-7405-ENG-48.

Diffused channel-waveguide couplers were fabricated on Z-cut y-propagating $LiNbO_3$ crystals by the indiffusion of titanium. Both mode spot sizes and coupling lengths were measured. The fields and coupling lengths were computed for both TM and TE polarizations from fabrication conditions. Good agreement was obtained between the measured and computed mode spot sizes and coupling lengths. It is concluded that the calculation method could aid in the design of such couplers.

4027 **Derivation of the generalized Langevin equation by a method of recurrence relations.** Lee, M.H. (Department of Physics, University of Georgia, Athens, Georgia 30602). *Journal of Mathematical Physics (New York);* **24**: No. 10, 2512-2514(Oct 1983). Contract AS09-77ER01023.

The generalized Langevin equation was first derived by Mori using the Gram-Schmidt orthogonalization process. This equation can also be derived by a method of recurrence relations. For a physical space commonly used in statistical mechanics, the recurrence relations are simple and they lead directly to the Langevin equation. The Langevin equation is shown to be composed of one homogeneous and one inhomogeneous equation.

4028 **Geometrical approach to moving-interface dynamics.** Brower, R.C.; Kessler, D.A.; Koplik, J.; Levine, H. (Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138). *Physical Review Letters;* **51**: No. 13, 1111-1114(26 Sep 1983).

A general class of models is introduced which relate the motion of a phase boundary to properties of the local interfacial geometry. These systems can undergo successive destabilizations as they grow, possibly giving rise to nonequilibrium spatial patterns. This formalism has applications to a wide variety of physical problems, especially including dendritic solidification.

4029 **Thermodynamic length and dissipated availability.** Sala-mon, P.; Berry, R.S. (Department of Mathematical Sciences, San Diego State University, San Diego, California 92182). *Physical Review Letters;* **51**: No. 13, 1127-1130(26 Sep 1983).

New expressions for the availability dissipated in a finite-time endoreversible process are found by use of Weinhold's metric on equilibrium states of a thermodynamic system. In particular, the dissipated availability is given by the square of the length of the corresponding curve, times a mean relaxation time, divided by the total time of the process. The results extend to local thermodynamic equilibrium if instead of length one uses distance (length of the shortest curve) between initial and final states.

4030 **Broadband population inversion.** Tycko, R. (Department of Chemistry and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review Letters;* **51**: No. 9, 775-777(29 Aug 1983). Contract AC03-76SF00098.

A theory is presented for construction of sequences of phase-shifted radiation pulses for coherently inverting populations over a broad band of transition frequencies. Such sequences have applications in nuclear magnetic resonance and coherent optics. Examples of sequences are derived, together with computer simulations of their inversion properties.

4031 **Schwinger variational method for the Bloch equation.** Whitlock, P.A.; Kalos, M.H.; Chester, G.V. (Courant Institute of Mathematical Sciences, New York University, 251 Mercer Street, New York, New York 10012). *Journal of Statistical Physics;* **32**: No. 2, 389-405(Aug 1983). Contract AC02-76ER03077.

A Schwinger variational principle has been derived for use in quantum, many-body systems at finite temperatures. The variational principle is a stationary expression for the density matrix which may be iterated to improve an approximate density matrix. It also can be used to find stationary expressions for observables. If an approximate, parametrized density matrix is used, the parameters are varied to find the regions where the variatonal principle is stationary. The variational density matrix obtained with the optimal parameters can be regarded as optimal for that observable. The method has been applied to two model problems, a particle in a box and two hard spheres at finite temperatures. The advantages and shortcomings of the method are discussed.

4032 **Semiclassical quantization and extraction of eigenfunctions using arbitrary trajectories.** De Leon, N.; Heller, E.J. (Theoretical Division, T-12, MSJ569, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **78**: No. 6, 4005-4017(15 Mar 1983).

We present in this paper a coordinate independent semiclassical quantization method. We demonstrate that in order to extract accurate eigenvalues and eigenfunctions the trajectory does not necessarily have to reside on the quantizing torus, rather, one can use information obtained on arbitrary tori. Because the method is coordinate independent, no difficulty is encountered in quantizing within classical resonance zones. Furthermore, nearby eigenstates and eigenvalues (nearby in action space) may be extracted from the same trajectory: this is especially convenient when the density of states becomes large.

4033 **Quantum collision theory with phase-space distribution functions.** Carruthers, P.; Zachariasen, F. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Reviews of Modern Physics;* **55**: No. 1, 245-285(Jan 1983).

Quantum-mechanical phase-space distributions, introduced by Wigner in 1932, provide an intuitive alternative to the usual wave-function approach to problems in scattering and reaction theory. The aim of the present work is to collect and extend previous efforts in a unified way, emphasizing the parallels among problems in ordinary quantum theory, nuclear physics, chemical physics, and quantum field theory. The method is especially useful in providing easy reductions to classical physics and kinetic regimes under suitable conditions. Section II, dealing in detail with potential scattering of a spinless nonrelativistic particle, provides the background for more complex problems. Following a brief description of the two-body problem, the authors address the N-body problem with special attention to hierarchy closures, Boltzmann-Vlasov equations, and hydrodynamic aspects. The final section sketches past and possibly future applications to a wide variety of problems. .FN * On leave of absence: Los Alamos National Laboratory, Los Alamos, New Mexico 87545.

4034 **Binary multiplexing and the phase-retrieval problem.** Ghiglia, D.C. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Optics Letters;* **7**: No. 12, 602-604(Dec 1982).

A binary-mask multiplexing method is developed that provides a means of recovering phase information unambiguously from measurements of the modulus of masked complex waves in the object and image planes, respectively. The technique is developed from Fourier-transform theory and combinatorial analysis and is derived for both the continuous case (optical—digital-hybrid implementation) and the totally discrete case (digital computer simulation). Computer simulations provide unambiguous recovery of phase information and indicate that the matrix equations are reasonably well conditioned for cases of practical significance.

4035 **Test of fidelity of phase conjugation.** Falk, J. (Lawrence Livermore National Laboratory, P.O. Box 5508, Livermore, California 94550). *Optics Letters;* **7**: No. 12, 620-622(Dec 1982). Contract W-7405-ENG-48.

The fidelity of the phase-conjugate signal produced by degenerate four-wave mixing was evaluated by conjugating and recombining the multiple-beam output from a phase grating. A single output beam resulted. If one or more of the beams emerging from the grating were blocked, additional beams appeared whose relative amplitudes agreed with theory for a perfect phase conjugator.

## 6580 Mathematical Physics

*REFER ALSO TO CITATION(S) 3989, 4249*

4036 **(IC—80/118) Spinor geometry: A genesis of extended supersymmetry.** Budini, P. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1980. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703972.

It is conjectured that euclidean geometry should be derived from spinor geometry through the equivalence of simple semispinor with isotropic semi n-vectors. The only tensors of complex 2n dimensional Euclidean space Esub(c)sup(2n) should then be: isotropic n - vectors and their intersections. Esub(c)$^4$ spinor geometry generates two isotropic semi bivectors equivalent to the semispinors of Esub(c)$^4$ (their geometrical properties are those of light propagating in vacuum), and their intersection: an isotropic vector (possibly representing momenta of massless particle and/or light rays); but no scalar, pseudoscalar or pseudovector is generated. In order to generate vectors outside the light cone in Msup(3.1) one needs not less than Esub(c)$^6$ spinor geometry which also generates Lorentz pseudoscalars and non isotropic pseudovectors and tensors. Besides, Dirac spinor should then always appear in doublets in Msup(3.1). Furthermore, the mer~ geometrical structure of Esub(c)$^6$ spinor geometry seems to suggest formally, both Poincare (extended) and conformal supersymmetry. The suggested spinor-geometrical approach privileges the elementary role of semispinors. Its relevance for the real world should be manifested by the privileged role of semispinors in elementary interactions as in fact seems to be the case with Lorentz semispinors in weak interactions (and could perhaps also be the case for strong ones where conformal semispinors (or twistors) could be the interacting spinor fields).

4037 **(IFVE-OTF—82-113) Two-dimensional exactly and completely integrable dynamic systems (Monopoles, instantons, dual models, relativistic strings, Lund-Regge model, generalized Toda lattice, etc).** Leznov, A.N.; Saveliev, M.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1982. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703977.

An investigation of two-dimensional exactly and completely integrable dynamical systems associated with the local part of an arbitrary Lie algebra, g, whose grading is consistent with an arbitrary integral embedding of 3d-subalgebra in g has been carried out. The corresponding systems of nonlinear partial differential equations of the second order h been constructed in an explicit form and their genral solutions in the sense of a Goursat problem have been obtained. A method for the construction of a wide class of infinite-dimensional Lie algebras of finite growth has been proposed.

4038 **(JINR—E-2-82-771) Representations of osp(1,4) in terms of three boson pairs and matrices of arbitrary even order. Description of the method.** Bednar, M.; Blank, J.; Havlicek, M.; Exner, P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703982.

Two-parameter family of infinite-dimensional Schur-irreducible representations of the Lie superalgebra osp (1, 4) is presented. The representations are derived in a purely algebraic way. The generators are represented in terms of tensor products of matrices 2n by 2n and polynomial functions of nine noncommuting variables psub(j), qsub(j), qsub(j)sup(-1), j=1, 2, 3, the psub(j), qsub(j) satisfying the canonical commutation relations. Besides the discrete parameter n, the representations are labelled by a continuous real parameter - the eigenvalue of the second-order Casimir operator. The even generators are represented skew-symmetrically and this property is shown to imply that each of the representations in the family is equivalent to a representation of the para-Bose algebra pB(2) having the physical "star properties": the creation and annihilation operators are adjoint to each other.

4039 **Eigenvalues of Casimir operators for the general linear and orthosymplectic Lie superalgebras.** Bincer, A.M. (Physics Department, University of Wisconsin—Madison, Madison, Wisconsin 53706). *Journal of Mathematical Physics (New York);* **24**: No. 11, 2546-2549(Nov 1983).

A Racah basis is introduced for the generators of these matrix superalgebras and explicit formulas are derived for eigenvalues of Casimir operators in terms of the components of the highest weight. The result contains, as special cases, the corresponding expressions for the general linear, orthogonal, and symplectic Lie algebras.

4040 **Completely solvable model of the nonlinear Boltzmann equation.** Ruijgrok, T.W. (Univ. of Utrecht, Netherlands); Wu, T.T. *Physica A (Amsterdam);* **113**: 401-416(1982). Contract AC02-76ER03227.

In one space and one time dimension, a model of the nonlinear Boltzmann equation is presented that is exactly solvable for all initial conditions. Furthermore, this model has the following desirable properties: (1) conservation of the number of particles; (2) energy conservation; (3) nonlinearity; (4) positivity of distribution functions; and (5) unique equilibrium state (for any given density) which is approached as $t \to \infty$ for most physically interesting initial conditions. Some of the simple properties of this model are studied.

# 70 FUSION ENERGY

## 7001 Plasma Research

*REFER ALSO TO CITATION(S) 3153, 3468, 3551, 3551, 4194, 4195*

4041 **(CLM-R—227) Soft X-ray imaging diagnostic on the HBTX 1A reversed field pinch.** Malacarne, M.; Hutchinson, I.H. (UKAEA Culham Lab., Abingdon). Sep 1982. 32p. Available from HMSO, London, price Pound 2.00.

Soft x-ray emission from the central region of the HBTX 1A reversed field pinch plasma has been measured using a pinhole camera with an array of surface barrier diodes. Internal fluctuations of the plasma, which include a significant turbulent component as well as more coherent modes, are measured using spectral and correlation analysis techniques. Results indicate the different correlation lengths for different fluctuation frequencies.

4042 **(CLM-R—229) Calculation of spectrum line emission from plasmas.** Gordon, H.; Tully, J.A.; Summers, H.P. (UKAEA Culham Lab., Abingdon). 1982. 41p. HMSO, London, price Pound 3.00.

This is the first of a series of papers which will describe a number of Fortran computer programs and their associated data sets which will predict spectrum line emission from important spe-

cies in fusion plasmas. The present work is concerned with the emission of line radiation by low lying excited states of ions. Three sets of plasma conditions are investigated, namely, the ionisation equilibrium plasma, the plasma developing in time and the plasma in a spatially inhomogeneous state.

4043 **(CLM-R—233) Tokamak disruptions.** Wesson, J.A.; Sykes, A.; Turner, M.F. (UKAEA Culham Lab., Abingdon). 1982. 9p. Available from HMSO, London, price Pound 2.00.

An explanation is given for the occurrence of tokamak disruptions. Under normal conditions the tearing instability is self-stabilising through its reduction of the destabilising current gradient and a saturated state can then exist. However under certain conditions further growth of the instability is itself destabilising and a disruption results. The transition to disruption has the form of a catastrophe.

4044 **(CLM-R—234) Models and codes for the plasma edge region.** Harbour, P.J.; Morgan, J.G. (UKAEA Culham Lab., Abingdon). Dec 1982. 121p. Available from HMSO, London, price Pound 6.00.

Models of the edge region of a toroidal plasma are described and developed, the eventual aim being to be able to link plasma models of one-dimensional parallel flow to a radial transport code and ultimately to an overall model of the NET system. It is concluded that parallel flow requires a two-fluid description, evaluated numerically or analytically. The full numerical approach, using program ZEPHYR, which is fully documented, is used for many test cases of the parallel flow model.

4045 **(CONF-8209191—1) Measurements of the microwave power in the wall at EBT-I/S.** Rasmussen, D.A.; Batchelor, D.B.; Hankins, O.E. (Oak Ridge National Lab., TN (USA); North Carolina State Univ., Raleigh (USA)). 1982. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE84000199.

From 3. international workshop on ECE and ECRW; Madison, WI, USA (9 Sep 1982).

An understanding of the microwave propagation and absorption in Elmo bumpy torus is critical because the plasma production, the heating, and the stabilization provided by the hot electron rings are dependent on these processes. A microwave power balance model was proposed earlier for EBT. This paper will describe a series of simple experiments designed to test this model by comparing its predictions and assumptions to both calorimetric and broad beam antenna measurements of microwave power at the wall in EBT-I/S.

4046 **(DOE/ER/53111—1) Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering.** Kantrowitz, F.; Conn, R.W. (California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering). Oct 1981. Contract AT03-81ER53111. 23p. NTIS, PC A02/MF A01. Order Number DE83016801.

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At high temperatures, large-angle nuclear elastic scattering can be significant for high-energy fusion products slowing down and pitch-angle scattering into the loss cone. An accurate treatment requires that the discrete nature of nuclear-scattering reactions be accounted for. For this purpose, a multigroup model has been formulated from a linearized Boltzmann equation. The fraction of fusion-product energy deposited in ions and electrons and lost is computed. Comparison is made to previous work where coulomb scattering alone in a TMR is considered and where nuclear and coulomb scattering are considered in an infinite plasma. Large-angle-scattering losses are found to depend more strongly on mirror ratio than do small-angle-scattering losses.

4047 **(DOE/ER/53112—T1) FIR laser-development program. Final report.** Danielwicz, E.J.; Hodges, D.T. (Aerospace Corp., Los Angeles, CA (USA). Electronics Research Lab.). 1980. Contract AC03-81ER53112. 16p. NTIS, PC A02/MF A01. Order Number DE83016541.

The important features for a source intended for use as a local oscillator in a low noise receiver have been tested on a developmental model of a cw FIR laser package. High output power (45 mW), good long term amplitude stability (+- 3%), high spectral purity and excellent frequency stability have all been demonstrated in the laboratory environment.

4048 **(DOE/ER/53140—10) Monte Carlo studies of tandem-mirror plasmas interacting with waves in the ion-cyclotron range of frequencies (ICRF). Annual report, October 1, 1982-September 30, 1983.** Todd, A.M.M. (Grumman Aerospace Corp., Princeton, NJ (USA)). Sep 1983. Contract AC02-82ER53140. 11p. NTIS, PC A02/MF A01. Order Number DE84002356.

A study of RF start-up, RF Fueling, and RF Anchor operation in Tandem Mirrors has been completed. Significant results include finding little performance difference between inboard and outboard antennas, and an optimum central-cell electron-to-ion-temperature ratio of between one and two. Several variance-reduction techniques, improved RF operators and a Monte Carlo neutral model have been incorporated in the code. Ongoing activities include studies of central-cell ICRF heating and hot-electron anchor operation of Tandem Mirrors, and Development of Monte Carlo non-maxwellian scattering operators. Completion of these ongoing activities, conversion of our Monte Carlo ICRF code to the NMECC CRAYS, and initial development of a new Monte Carlo RF code for 3-D mirror equilibrium geometries comprises our proposed program for FY '84.

4049 **(DOE/ER/53150—T2) Reversed field pinch dynamics and transport studies. Quarterly progress report, 20 July 1983-20 October 1983.** Schnack, D.D. (Science Applications, Inc., La Jolla, CA (USA)). 20 Oct 1983. Contract AC03-83ER53150. 9p. NTIS, PC A02/MF A01. Order Number DE84002124.

Progress in RFP dynamics and transport studies is described. The compressible, three-dimensional code SPECTR3 has been modified to include toroidal effects, and classical resistivity and thermal conductivity. Anomalous transport arising from stochastic magnetic fields has been included in the model. These transport effects are treated implicitly. A three-dimensional, incompressible MHD code has been developed. It is computationally more efficient than the existing code, and will be used extensively if compressibility is determined to be unimportant. Post-processor codes to analyze data generated by the nonlinear code have been developed. Three-dimensional computer runs at low Θ (= B/sub theta/(a)/<B/sub Z/>) have found the development of a substantial stochastic core, with good flux surfaces being retained in the outer part of the discharge. Runs at high Θ have shown complete stochasticity, with reappearance of outer flux surfaces as the modes saturate and relax. Anomalous maintenance of positive toroidal flux arising from a poloidal electric field at the field reversal surface induced by MHD fluctuations (dynamo) has been observed. We are collaborating with the ETA-BETA-II experimental group at Padua, Italy, in an attempt to interpret measured internal fluctuations and profiles in terms of resistive MHD. The emphasis of this work is on the effect of MHD fluctuations plasma transport. Analytic studies of the RFP dynamo have begun. We are attempting to find steady state solutions with flow to the resistive MHD equations. A reduced model to simulate phenomena that occur on the relaxation time scale, such as F-Θ current drive, has been formulated.

4050 **(DOE/ER/54010—T1) Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report.** Conn, R.W. (California Univ., Los Angeles (USA)). 1983. Contract AT03-82ER54010. 13p. NTIS, PC A02/MF A01. Order Number DE83016756.

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A one-dimensional model describing the species and spatial power deposition profiles for the fast wave second harmonic heating scheme in a tokamak was developed. In this model, the plasma is divided along the midplane into vertical slabs, in each of which the plasma parameters and the magnetostatic field are assumed to be uniform. Using the full kinetic treatment, the local dispersion relation for the fast and ion-Bernstein modes is solved, and the wave field is written as a sum of the individual mode components. Limiter design evolution has converged to a rigidly mounted, large area,

slotted flat plate toroidal limiter. Efficient particle removal is achieved by locating the neutralization site remotely from the plane of slots. The plasma flows behind the limiter and, using an inclined deflector/neutralizer plate is ballistically scattered toward an off-centre pump duct. In view of the relatively long He mfp, use of a deflecting plate eases the problems arising from excessive de-enrichment at the pump.

4051 **(DOE/ET/51013—100) Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments.** Takase, Y. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Oct 1983. Contract AC02-78ET51013. 225p. NTIS, PC A10/MF A01. Order Number DE84002809.

Parametric excitation of ion-cyclotron quasi-modes (ω/sub R/ ≃ nω/sub ci/) and ion-sound quasi-modes (ω/sub R/ ≃ k/sub parallel to/v/sub ti/) during lower hybrid wave heating of tokamak plasmas have been studied in detail. Such instabilities may significantly modify the incident wavenumber spectrum near the plasma edge. Convective losses for these instabilities are high if well-defined resonance cones exist, but they are significantly reduced if the resonance cones spread and fill the plasma volume (or some region of it). These instabilities preferentially excite lower hybrid waves with larger values of n/sub parallel to/ than themselves possess, and the new waves tend to be absorbed near the outer layers of the plasma. Parametric instabilities during lower hybrid heating of Alcator C plasmas have been investigated using rf probes (to study tilde phi and tilde n/sub i/) and $CO_2$ scattering technique (to study tilde n/sub e/). At lower densities (anti n/sub e/ $\leqq$ 0.5 x $10^{14}cm^{-3}$) where waves observed in the plasma interior using $CO_2$ scattering appear to be localized, parametric decay is very weak. Both ion-sound and ion-cyclotron parametric decay processes have been observed at higher densities (anti n $\geqq$ 1.5 x $10^{14}cm^{-3}$) where waves appear to be unlocalized. Finally, at still higher densities (anti n /sub e/ greater than or equal to 2 x $10^{4}cm^{-3}$) pump depletion has been observed. Above these densities heating and current drive efficiencies are expected to degrade significantly.

4052 **(DOE/ET/53001—4) Applications of hybrid numerical-simulation methods to magnetic-confinement systems.** Morse, R.L. (Arizona Univ., Tucson (USA)). [nd]. Contract AC02-77ET53001. 41p. NTIS, PC A03/MF A01. Order Number DE84001134.

During this contract period we started out to extend and refine our kinetic modeling of wall plasmas near divertors or limiters to include, in particular, prediction of sputtering rates. As a result of seeing data indicating edge temperatures below the kinetic range, and some questions about previous fluid modeling, we also began our own fluid modeling. One of the fluid results which we found interesting is a class of solutions which are not stationary but exhibit periodic relaxation oscillations. We speculate about a possible relationship between these solutions and the H-mode. Also during this period we have done calculations of Argon radiation power at typical Tolemak densities and over a wide range of temperatures. The power at typical Tolemak densities and over a wide range of temperatures. The results of this work may have interesting implications for main plasma energy containment and ignition as well as for edge plasma control.

4053 **(DOE/ET/53045—7) Nonlinear magnetohydrodynamic. Summary of recent activity (Task I). Progress report.** (College of William and Mary, Williamsburg, VA (USA)). Sep 1983. Contract AS05-76ET53045. 15p. NTIS, PC A02/MF A01. Order Number DE84002638.

We are currently investigating the effects of including sufficient ICRH that the ambipolar electric field E/sub r/ > 0 so that the ions are non-resonant. Dandl and Guest have recently pointed out that if a steady state regime can be found with E/sub r/ > 0, then the particle confinement time (which is set by ion scattering) can be increased by a factor of (m/sub i//m/sub e/)/sup 1/2/, - the square root of the mass ratio. However, Hedrick has pointed out to us that while the particle transport can be reduced by (m/sub e//m/sub i/)/sup 1/2/, the energy transport need not be so reduced because the dependence of the energy flux on E/sub r/ and the control variables (filling pressure, microwave power densities) is different from that of the particle flux. We intend to compare both cases: reduced energy flux and unaffected energy flux.

4054 **(DOE/ET/53088—110) Beat-wave current drive in a magnetized plasma.** Galvao, R.M.O.; Tajima, T. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1983. Contract FG05-80ET53088. 14p. NTIS, PC A02/MF A01. Order Number DE84001556.

It is shown that large currents can be efficiently driven in magnetically confined plasmas by the ponderomotive force created by the beating of two electromagnetic waves. The beating waves can be cyclotron waves propagating parallel to the magnetic field or light waves propagating obliquely to the magnetic field.

4055 **(EUR-CEA-FC—1170) Computation code for the energy deposition calculation of a resonant wave near the electron cyclotron frequency.** Cano, R.; Capes, H.; Ha Quang, D.; Mercier, C.; Morera, J.P. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). Feb 1983. 19p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700014.

A model is developed which allows a calculation of the energy deposition in a Tokamak plasma from an electron cyclotron wave for an ordinary mode propagating from the exterior near the equatorial plane and at right angles to the magnetic field. The calculation, in cylindrical geometry, takes account of the spatial width of the incident beam and of its energy profile in the direction perpendicular to the equatorial plane. A numerical code coupled to the Makokot transport code is described.

4056 **(EUR-CEA-FC—1171) Magnetic islands and turbulence.** Mercier, C. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). Feb 1982. 36p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700015.

The magnetic islands which develop in fusion plasmas play a very significant part in the global "behaviour" of this medium. In this article general analytical expresion are drawn up, which are compared with a great number of digital calculations of magnetic lines. The model used reproduces very well the principal characteristics of the discharges with internal disruption. On this model, the analytical formulae can be generalized semi-empirically, thus enabling the digital results to be very well represented and the interactions between islands to be understood, as well as the start of the turbulent stage in these plasmas.

4057 **(EUR-CEA-FC—1173) Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering.** Bruneau, J.L. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee; Orleans Univ., 45 (France)). Feb 1983. 163p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE84700016.

Because of the close relation between the $D_2O$ pulse and the pumping pulse, and the inadequate spectral quality of pulsed $CO_2$ laser beams, we were led to consider optical pumping as a whole. We designed an oscillator with emphasis on mechanical stability. The single-mode energy had to be increased, with a reproducibility close to 100% and a flexibility of use and conversion appropriate to the study of the $D_2O$ oscillator. Then, with the density matrix formalism, we defined theoretically the response at 66 μm from the $D_2O$ molecular system excited by the 9.657 μm line of the single-mode $CO_2$ laser. For the first time, this analysis is given systematically for the Raman transition. The discussion demonstrates several characteristic features of this emission, such as the dynamic Stark effect and frequency slip. It is generalized to pumping by a $CO_2$ pulse containing only longitudinal modes. Detailed spectrum analysis and a study of the $D_2O$ pulse polarization yields firstly an experimental configuration of the theoretical results. We then derive the operating conditions under which the $D_2O$ pulse can satisfy the criteria for Thomson scattering. In the final section, the $D_2O$ oscillator pulse is compared with an open cavity pulse under the same pumping conditions.

4058 **(IAE—3588/16) Program complex for computation of the two-dimensional plasma distribution function in the OGRA-4 magnetic trap.** Pozharov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703992.

A set of computer codes is described for two-dimensional calculation of the plasma distribution function in the OGRA-4 magnetic trap. The code is intended for computing the plasma parameters in traps of a baseball configuration. The computer code has a block structure and may be used both independently and in conjuction with other computer codes. Practically all the codes are written in the FORTRAN-GDR language, with minor quantity of codes being written in the MADLEN autocode.

4059 **(IAE—3600/6) Transport factors due to the dissipative ballooning models.** Gribkov, V.M.; Pogutse, O.P.; Shurygin, R.V.; Yurchenko, Eh.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700019.

Ballooning modes in unideal plasma are considered and the effect of the finite conductivity and anomalous viscosity on their development is investigated. The anomalous viscosity is shown to result in an abrupt increase of instability increments. The plasma stability criterion relative to finite amplitude oscillations has been obtained. Turbulent transport factors due to the ballooning mode development have been calculated.

4060 **(IC—82/132) Radial distribution function and second virial coefficient for interacting bosons.** Khanna, K.M.; Singh, S.C. (International Centre for Theoretical Physics, Trieste (Italy)). Aug 1982. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703993.

Radial distribution function and second virial coefficient have been calculated for a dilute and high density system of interacting bosons using Gaussian potential and Lennard-Jones potential as the two-body interaction potential. The results have been compared with those obtained experimentally for liquid $He^4$.

4061 **(ILE—8202P) Generation of super-fast ions due to nonlinear processes near the quarter critical density in laser-produced plasmas.** Yamada, Kawakatsu; Sakabe, Shuji; Miyanaga, Noriaki; Inada, Yoshifumi; Kato, Yoshiaki. (Osaka Univ., Suita (Japan). Inst. of Laser Engineering). 19 Jan 1982. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700020.

We have experimentally studied the correlation between the $3/2\omega_0$ emission of radiation and the generation of super-fast ions (>=MeV) which we have observed for the first time. It was found that the generation of the super-fast ions are correlated with the appearance of the filamentary structure in the spatial distribution of the $3/2\omega_0$ emission. We will show that the super-fast ions are generated by the acceleration due to the ambipolar field of super-hot electrons which are produced in the small scale filaments in the underdense plasma near the quarter critical density.

4062 **(INIS-mf—8577) Wills Plasma Physics Department annual progress report 1982.** (Sydney Univ. (Australia). School of Physics). 1982. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703994.

Progress in the experimental program using the research tokamak TORTUS is presented. The main thrust of the program is the study of the characteristics of hydromagnetic waves in tokamak plasmas and in the use of such waves in r.f. heating. Work on runaway electron production, on wave propagation in collisional plasmas and on hydromagnetic shock wave studies is reported. Diagnostic techniques and equipment described include a laser interferometer system and techniques based on the observation of resonance fluorescence and near-resonant scattering of a laser beam from atomic species in a plasma.

4063 **(IPPJ—552) Population inversion in an optically thick recombining hydrogen plasma.** Furukane, Utaro; Yokota, Toshiaki; Kawasaki, Ken; Oda, Toshiatsu. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700021.

The plasma condition is theoretically investigated for population inversion between the first two excited states of hydrogen atoms in a recombining plasma. The rate equation including atom-atom collision terms is solved consistently with the optical escape factors. The upper bound value of the ground level population density (n1)sub(max) necessary for inversion in the optically thick plasma at specified electron density and temperature is almost inversely proportional to the mean radius of the plasma $r_0$. With decrease in the atom temperature, the upper bound values increase in the optically thin plasma, but decrease in the optically thick plasma.

4064 **(IPPJ—554) Electron cyclotron heating of stellarator plasma with the ordinary and the extraordinary modes in JIPP T-II.** Ohkubo, K.; Kawahata, K.; Noda, N.; Ogawa, I.; Kako, E. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700023.

Experimental studies of electron cyclotron heating in stellarator plasma have been carried out by injecting 40 kW of 35.5-Ghz microwave power. Electron cyclotron heatings with the ordinary and the extraordinary modes injected from the low field side show almost the same heating efficiency of $2.2 \times 10^{13}$ eV.cm$^{-3}$.kW$^{-1}$ at the averaged electron density of $6 \times 10^{12}$ cm$^{-3}$. Efficient heating by the extraordinary mode in the presence of the cyclotron cutoff is interpreted to be achieved by the penetration of scattered waves from high and low field sides, because the wave polarization is scrambled by the reflection at the chamber wall.

4065 **(IPPJ—555) Conversion of compressional Alfven waves into ion cyclotron waves in inhomogeneous magnetic fields.** Amagishi, Y.; Tsushima, A.; Inutake, M. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700024.

Axisymmetric compressional Alfven (fast) waves, which propagate into a region of an increasing magnetic field in a cylindrical plasma, are observed to be converted into ion cyclotron (slow) waves via ion cyclotron resonances.

4066 **(IPPJ—556) Mode conversion and local heating below the second electron cyclotron harmonic.** Sugai, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700025.

An extraordinary wave is normally incident on a large volume magnetoplasma. Below the second gyroharmonic, conversion into short-wavelength Bernstein wave is observed near the upper-hybrid layer. Significant conversion efficiency is attained in the optimum conditions. In the high-power incidence, considerable electron heating due to the converted wave is found to be localized in the mode-conversion region.

4067 **(IPPJ—557) Heat flux in the presence of shifting cold and hot electron Maxwellian distributions.** Ichiba, Hideo; Ogasawara, Masatada. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700026.

Heat flux is evaluated in the case of shifted Maxwellian velocity distribution function with cold and hot electrons. The heat flux associated with the cold electron temperature gradient nabla sub(x)T sub(C) tends to flow in the direction of increasing T sub(C). This flux inversion is enhanced due to the shifting velocities of the cold and hot electrons. Even for a small shifting velocity as mv sub(H)sup(2)/2T sub(H) = 0.3 (v sub(H) and T sub(H) are the shifting velocity and the temperature of the hot electrons), value of the heat flux becomes more than twice as large as the value without the shifting velocities.

4068 **(IPPJ—558) Stabilization of electrostatic flute mode due to hot electron ring and rf field.** Sanuki, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 28p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700027.

The stability of electrostatic flute modes has been studied on the basis of a relatively simple model of a bumpyless cylinder with artificial gravity and an ambipolar field. The dynamic stabilization of these modes due to the rf electric field has also been discussed. It turned out that the electrostatic flute modes could be stabilized effectively by the rf field together with the effects of hot electron ring.

4069 **(IPPJ—559) Possible method for burn control by compression-decompression.** Okamoto, Masao; Hirano, Keiichi; Ohnishi, Masami. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700028.

The possible method for the control of burning plasmas in ignited tokamaks is presented. By applying the small scale major radius compression-decompression repeatedly to the plasma with the feedback control, the thermal instability can be suppressed and the plasma stays at an unstable ignition equilibrium point. The variation of major radius $\Delta R$ during the control scales like $\Delta R/R \sim -\Delta n/2n$, where R is the major radius, n is the density and $\Delta n$ is the change in density during control.

4070 **(IPPJ—567) Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus.** Noda, N.; Kaneko, O.; Ohkubo, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1982. 25p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700029.

A hydrogen beam of 16 kV, 4 A was co-injected into hydrogen plasmas and coupled to an rf of 800 MHz, up to 150 kW. It has been observed with the measurement of parallel charge-exchange neutrals that the fast ions above 16 keV are enhanced by the interaction with the lower hybrid waves. The enhancement is critically reduced when the line-averaged electron density is higher than $1.6 \times 10^{13}$ cm$^{-3}$ both in the toroidal fields of 22 kG and 16 kG. For the 22 kG case, the cause of the reduction may be related to the location of the turning point of the incident waves; that is, the turning point, in higher densities, locates outside the region where the fast ions produced by NBI are relatively abundant. For the 16 kG case, however, this interpretation is valid only when a part of the incident wave energy is transferred into waves of shorter wavelengthes. The ion-temperature increment in the simultaneous heating agrees with the sum of those in the individual heatings even when the beam-rf interaction is considerably strong.

4071 **(IPPJ—575) Analysis of current drive by travelling wave based on theory of intrinsic stochasticity.** Murakami, Akihiko; Midzuno, Yukio. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1982. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700030.

The mechanism of the current generation in a collisionless plasma by a train of travelling mirrors with modulated phase velocity is studied based on the theory of intrinsic stochasticity. It is shown that, if the phase modulation is small, the main contribution to the current generation comes from the phase mixing of the trajectories of trapped electrons in each Fourier component of a driving wave. For the case of a moderate phase modulation, however, formation of a large stochastic region due to the overlapping of primary resonances is very effective for increasing the generated current. Large phase modulation has little advantage in the current generation because the stochastic regions are formed, so to speak, at random in the phase plane. The results of analytical evaluation based on the above theory agree quite well with results of numerical experiments.

4072 **(IPPJ—576) Evolution of ring current formed by relativistic electron beam injection into a charge but not current neutralizing plasma.** Narihara, Kazumichi. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700031.

The time evolutions of the azimuthal momentum distribution of the axisymmetrically injected electrons and the resulting ring current are self-consistently analyzed under the assumption that no return current is induced in the background plasma. It is shown that the ring current grows linearly with time for a characteristic time from the start of beam injection, and afterthere it tends to saturate at some level. The dependence of the time evolution of the ring current on the beam energy at injection and on the injection current is also obtained.

4073 **(IPPJ—580) Determination of metastable fraction in an ion beam extracted from ECR plasma.** Matsumoto, Atsushi; Ohtani, Shunsuke; Iwai, Tsuruji. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1982. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700032.

The fraction of metastable-state $Ar^{2+}$ ($3p^4$ $^1D$) ions in $Ar^{2+}$ beam has been determined by an optical attenuation method (OAM) combined with the conventional beam attenuation method. The present OAM is based on observation of spatial decay of specified emission line intensities arising from charge-changed ions, along the beam axis in a target gas cell. The validity of the OAM is discussed in detail. The cross sections for one-electron capture by the ground-state $Ar^{2+}$ ($^3P$) ions, $\sigma_{21}$, and by the metastable-state $Ar^{2+}$ ($^1D$) ions, $\sigma_{21}$ *, from Na have been measured independently by the OAM. Both the cross sections are of the order of $10^{-14}$ cm$^2$ and $\sigma_{21}$ * is about 1.3 times as large as $\sigma_{21}$ at the collision energy of 1.5 keV.

4074 **(IPPJ—583) Formation of relativistic electron beam rings in a conducting cavity.** Mohri, Akihiro; Narihara, Kazumichi; Tomita, Yukihiro; Tsuzuki, Tetsuya; Hasegawa, Mitsuru. (Nagoya Univ. (Japan). Inst. of Plasma Physics). May 1982. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700033.

It was experimentally demonstrated that a relativistic electron beam ring of spheromak configuration is formed and stably kept in a conducting cavity of rectangular cross section without any help of external magnetic field for equilibrium. Here, a rotating electron beam was injected through a hole of the cavity.

4075 **(ITF—82-69-R) Fluctuation and radiation processes in bounded plasma-molecular systems.** Golubinskij, P.K.; Zagorodnij, A.G.; Pegova, V.S.; Yakimenko, I.P. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1982. 56p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83703995.

Theory of fluctuations and spontaneous emission of semiconfined and confined partially-ionized plasma with provision for system nonequilibrium, thermal motion of charged particles, collisions of electrons and ions with neutral and dynamics of a molecular subsystem is developed. Calculation of fluctuation spectra is performed on the basis of the Langevin approach. At that, interaction of electromagnetic fields with atoms and molecules is described with equation of motion of polarization vector of two-level quantum system and induced currents in charged particle subsystems are determined on the basis of probable approach when using the Bhatnagar-Gross-Krook model for describing collisions of electrons and ions with neutral particles. Correlation functions of fluctuation sources related to electron and ion subsystems are determined within the framework of probable approach and correlation functions of polarization sources - on the basis of generalization of fluctuation-dissipative theorem. Effect of active molecules on spectral distribution of fluctuations and emission intensity of half-space and layer of nonequilibrium plasma is investigated.

4076 **(KFTI—82-48) Far infrared heterodyne laser interferometer.** Berezhnyj, V.L.; Epishin, V.A.; Kononenko, V.I.; Maslov, V.A.; Pavlichenko, O.S.; Svich, V.A.; Topkov, A.N. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1982. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700035.

Results of developments of a heterodyne submillimeter laser interferometer (lambda=118.8 $\mu$m) for the measurement of the

plasma electron concentration are given. Structural peculiarities of interferometer quantum generators and elements are described. A method for investigating characteristics of oscillation types of laser resonators containing side dielectric walls and large-scale (d >> lambda) amplitude phase inhomogeneities in reflectors has been theoretically developed. Results of investigation of interferometer working capacity on a plasma device and measurements of the plasma electron concentration are presented. Minimal measured phase shift $\Delta phi/2\pi = 10^{-2}$ (nLsub(min)=2.8x10sup(13) $cm^{-2}$), time resolution is $10^{-6}$ s. Specifications of a set of interferometer apparatuses are given.

4077 **(LA—9848-MS) Plasma effects on Heliac configurations: a preliminary investigation.** Mondt, J.P. (Los Alamos National Lab., NM (USA)). Aug 1983. Contract W-7405-ENG-36. 30p. NTIS, PC A03/MF A01. Order Number DE84002299.

Plasma effects on equilibrium, stability, and transport properties of helical stellarators with a hardcore current through the center (Heliac) are investigated, mainly analytically and with an emphasis on understanding the underlying physics and rough scaling rather than on accuracy and completeness. The presently reported results provide a focus in parameter space for further detailed research on the feasibility of the Heliac concept, as well as some tools with which to carry out such investigations.

4078 **(NIIEFA-P-K—0570) Development and study of the first-stage amplification unit of the TIR-1M $CO_2$-laser installation.** Burtsev, V.A.; Gordejchik, A.G.; Kuchinskij, A.A.; Rodichkin, V.A.; Sheverev, V.A. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1982. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700037.

Results of experimental study of the pumping system of pulse $CO_2$-laser (amplifier) with ultraviolet preionization are described. Dependences of the small signal amplification factor and its distribution along the amplification aperture on the parameters of discharge-supplying system, pressure and composition of the mixture are obtained. The parameters of the pumping system providing for uniform spatial amplification factor distribution, its value runs into 0.0375 $cm^{-1}$. Laser parameters being optimized, the energy output is approximately 30 J/lxatm, the efficiency is approximately 9%. Study of possible laser operation with selective resonator is carried out. Results of experiments on slightly ionized impurity effect on pumping discharge characteristics are dicussed.

4079 **(ORNL/TM—8713) Preionization and start-up in the ISX-B tokamak using electron cyclotron heating at 28 GHz.** Kulchar, A.G.; Eldridge, O.C.; England, A.C.; Bush, C.E.; Edmonds, P.H.; Kelley, G.G.; Loring, C.M.; Peng, Y.K.M.; Wilgen, J.B.; Borowski, S.K. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 31p. NTIS, PC A03/MF A01. Order Number DE84002261.

A 28-GHz gyrotron was used to produce a plasma at the electron cyclotron resonance in the Impurity Study Experiment (ISX-B) tokamak. The influence of the toroidal magnetic field magnitude, error fields, gas pressure, microwave power, microwave pulse length, and microwave timing was studied for experiments with magnetic field and gas only. Also, experiments with preionization followed by capacitor discharges were carried out in which these quantities were varied, as were the capacitor bank voltages. Optimum conditions of preionization for some of the parameters were determined. A theoretical model that adequately reproduces the data is given. Calculations based on this model show the temporal evolution of the electron temperature and density, the neutral density, and the plasma current. The model adequately accounts for present and previous experimental results and can be used to make predictions for future experiments.

4080 **(ORNL/TM—8837) WHISTBT: a 1-1/2-D radial-transport code for bumpy tori.** Hastings, D.E.; Houlberg, W.A.; Attenberger, S.E.; Lee, D.K. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 69p. NTIS, PC A04/MF A01. Order Number DE84002269.

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The computer code WHISTBT has been developed from the Oak Ridge National Laboratory WHIST code to study radial transport in bumpy tori. The code can handle both positive and negative ad hoc electric fields for devices ranging from the size of ELMO Bumpy Torus-Scale (EBT-S) to a reactor-type device, EBT-R. Fueling can be by gas puffing or pellets; heating can be by injection of rf power or neutral beams.

4081 **(ORNL/TM—8871) Oak Ridge National Laboratory ELMO Bumpy Torus radially resolved, time-dependent, one-dimensional transport code - user's guide.** Downum, W.B.; Jaeger, E.F. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 81p. NTIS, PC A05/MF A01. Order Number DE84002976.

The Oak Ridge National Laboratory Radially Resolved Time-Dependent One-Dimensional Transport code is described. The physical models and numerical techniques incorporated to follow the time evolution of ELMO Bumpy Torus plasmas ranging in size from the present experiment to power reactors are discussed. Sample input/output files are presented, and instructions for use on the Oak Ridge DEC-10 and the National Magnetic Fusion Energy Computer Center CRAY systems are given.

4082 **(ORNL/TM—8874) Observation of hot-electron ring instabilities in ELMO Bumpy Torus.** Hiroe, S.; Wilgen, J.B.; Baity, F.W.; Berry, L.A.; Colchin, R.J.; Davis, W.A.; El Nadi, A.M.; Haste, G.R.; Hillis, D.L.; Spong, D.A. (Oak Ridge National Lab., TN (USA)). Dec 1983. Contract W-7405-ENG-26. 50p. NTIS, PC A03/MF A01. Order Number DE84002973.

A high-frequency hot electron instability is observed in ELMO Bumpy Torus (EBT) plasmas when the hot electron-to-ion density ratio exceeds 0.4. Both the real frequency and the imaginary frequency are larger than the ion cyclotron frequency. The azimuthal mode number (m) is 7, and the instability rotates in the hot electron curvature drift direction. This instability is identified as a curvature-driven mode. When it is strongly excited, the equilibrium of the hot electron annuli and confined core plasmas are destroyed (disruption). Extensive ion heating and neutron bursts are associated with this instability.

4083 **(RL—82-116) Decay of an electromagnetic wave into an ion-acoustic wave and a Langmuir mode which is heavily damped.** Bingham, R. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Dec 1982. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703999.

The parametric decay of an electromagnetic wave into an ion-acoustic wave and a heavily damped Langmuir mode is studied. The instability is not localized to the critical density region but can occur in sub-critical density regions where ksub(l) γsub(de) approximately > 1. The instability increases absorption of electromagnetic waves in a plasma, the energy going mainly into the production of fast electrons.

4084 **(UCRL—89570) Streak cameras for soft x-ray and optical radiation.** Medecki, H. (Lawrence Livermore National Lab., CA (USA)). 1 Sep 1983. Contract W-7405-ENG-48. 8p. (CONF-831195—2). NTIS, PC A02/MF A01. Order Number DE84002780.

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Portions are illegible in microfiche products.

The principal component of a streak camera is the image converter tube. A slit-shaped photocathode transforms the radiation into a proportional emission of electrons. An electron - optics arrangement accelerates the electrons and projects them into a phosphor screen creating the image of the slit. A pair of deflection plates deflects the electronic beam along a direction perpendicular to the main dimension of the slit. Different portions of the phosphor screen show the instantaneous image of the slit with brightness proportional to the number of emitted electrons and, consequently, to the intensity of the radiation. For our x-ray streak cameras, we use the RCA C73435A image conventer tube intended for the measurement of the radiation of light and modified to have an

x-ray sensitive photocathode. Practical considerations lead to the use of transparent rather than reflecting photocathodes. Several of these camera tubes are briefly described.

4085 **Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer.** Groebner, R.J.; Brooks, N.H.; Burrell, K.H.; Rottler, L. (GA Technologies, Incorporated, P. O. Box 85608, San Diego, California 92138). *Applied Physics Letters;* **43**: No. 10, 920-922(15 Nov 1983). Contract AT03-76ET51011.

Spatially and temporally resolved values of the ion temperature and toroidal rotation velocity near the plasma axis have been obtained in neutral beam-heated plasmas in the Doublet III tokamak from measurements of the Doppler broadening and Doppler shift of the He II 4686-A line, excited by charge transfer reactions between fast hydrogen atoms in the beam and thermal helium ions in the plasma. The measurement technique, which uses visible optics and a multichannel detector, promises to be a straightforward method to obtain ion temperature profiles in beam-heated tokamaks.

4086 **Particle lifetime scaling in field-reversed configurations based on lower-hybrid-drift resistivity.** Hoffman, A.L.; Milroy, R.D. (Mathematical Sciences Northwest, Inc., Bellevue, Washington 98004). *Physics of Fluids;* **26**: No. 11, 3170-3172(Nov 1983). Contract AC06-80ER53096.

The particle lifetime scaling for field-reversed configurations is derived in the limit where classical resistivity is negligible and anomalous resistivity is dominant. This scaling is shown to have the form tau/sub N/proportionalS$^4$(1+C/S)$^2$, where S is the ratio of the major radius to ion Larmor radius. The term in parentheses represents a contribution from open field line confinement which is very significant for present small-S field-reversed configurations since C has a typical value of 50. The open field line confinement only loses importance for reactor-sized plasmas with major radii approaching 1 m.

4087 **Quasilinear saturation effects on electron cyclotron wave damping of the ordinary mode in tokamak plasmas.** Fidone, I.; Meyer, R.L.; Granata, G. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 11, 3292-3299(Nov 1983). Contract AC02-76CH03073.

The quasilinear theory of electron cyclotron wave absorption for the ordinary mode propagating normal to the tokamak magnetic field is investigated. A two-dimensional initial value code has been developed to investigate the distortion of the electron momentum distribution from an initial Maxwellian. It is shown that for powers of interest for electron heating in future tokamaks, Coulomb electron collisions are not sufficient to avoid quasilinear flattening of the electron distribution; therefore, there is a reduction in the damping rate as compared to the linear case.

4088 **Linear and quasilinear theory of second electron cyclotron harmonic heating of tokamak plasmas.** Hsu, J.Y.; Chan, V.S.; McClain, F.W. (GA Technologies, Inc., San Diego, California 92138). *Physics of Fluids;* **26**: No. 11, 3300-3307(Nov 1983). Contract AT03-76ET51011.

Heating and current drive by electron cyclotron waves with the second harmonic resonance layer lying inside the plasma is studied. The full warm-plasma dispersion relation is solved numerically in a slab plasma model with assumed density and temperature profiles to study the scaling laws of heating, the spatial profiles of power deposition, and the rf-driven current. The current drive, via the anisotropic resistivity, is obtained analytically for weak rf within the Lorenz model and numerically from a Fokker—Planck code. Mode conversion from an ordinary mode to the extraordinary takes place at the incident angle of 35 deg. The allowed angular spread for efficient energy penetration is enhanced by a factor of 1.5 over that of the fundamental, and therefore makes this scheme workable and heating and current drive in high-density plasmas possible. The current drive efficiency is markedly improved when energy is damped through the electrostatic Bernstein mode.

4089 **Stability of equilibria with helical magnetic axis.** Mond, M. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physics of Fluids;* **26**: No. 11, 3327-3331(Nov 1983).

The stability of equilibria with a helical magnetic axis is studied. First, two families of equilibria whose applied fields have the same pitch as the magnetic axis are investigated. The two families differ from each other by the ordering of the physical variables with $\beta$. Then, the energy principle is used in order to check the stability properties of the equilibria. It is shown that low-$\beta$, low-shear systems with zero net current are stable for arbitrary values of the pressure if the deviation from straight magnetic axis is large enough.

4090 **Plasma heating with strong poloidal Ohmic currents.** Holly, D.J.; Prager, S.C.; Sprott, J.C. (University of Wisconsin, Madison, Wisconsin 53706). *Physics of Fluids;* **26**: No. 11, 3435-3439(Nov 1983).

The feasibility of using strong poloidal currents to heat plasmas has been examined experimentally in Tokapole II, operating as a toroidal octupole. The plasma resistivity ranges from that of Spitzer to about 1500 times Spitzer resistivity, as predicted by mirror-enhanced resistivity theory. This allows large powers (approximately 2 MW) to be coupled to the plasma at modest current levels. However, the confinement time is reduced by the heating, apparently due to a combination of the input power location (near the walls of the vacuum tank) and fluctuation-enhanced transport.

4091 **Viscosity-driven impurity transport in a stellarator.** Shaing, K.C. (Fusion Energy Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physics of Fluids;* **26**: No. 11, 3164-3167(Nov 1983). Contract W-7405-ENG-26.

The viscosity-driven impurity transport in a stellarator in the $1/\nu$ and collisionless detrapping regimes is calculated. It is found that the impurity flux tends to go inward radially if all the species are in the $1/\nu$ regime and tends to go outward if all the species are in the collisionless detrapping regime.

4092 **Scaling of oblique plasma double layers.** Borovsky, J.E. (Max-Planck-Institut fuer Aeronomie, D-3411 Katlenburg-Lindau 3, Federal Republic of Germany). *Physics of Fluids;* **26**: No. 11, 3273-3278(Nov 1983).

A systematic study of oblique nonlinear potential structures is presented. The results of particle-in-cell numerical simulations, numerical solutions to the Poisson—Vlasov equations, and Poisson—Vlasov theory all support Debye-length scaling.

4093 **Neoclassical flows and transport in nonaxisymmetric toroidal plasmas.** Shaing, K.C.; Callen, J.D. (Nuclear Engineering Department, University of Wisconsin-Madison, Madison, Wisconsin 53706). *Physics of Fluids;* **26**: No. 11, 3315-3326(Nov 1983). Contract AC02-80ER53104.

The moment equation approach to neoclassical transport theory has been generalized to nonaxisymmetric toroidal systems under the assumption of the existence of magnetic surfaces. In particular, the parallel plasma flows and bootstrap current are calculated in both the Pfirsch—Schlueter and banana regimes. It is found that both parallel plasma flows and the bootstrap current can be reduced as the toroidal bumpiness increases in an otherwise axisymmetric system.

4094 **Growth rate of the clump instability.** Tetreault, D.J. (Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physics of Fluids;* **26**: No. 11, 3247-3261(Nov 1983).

The instability of phase space density granulations or clumps has recently been reported. A theory for the growth rate of the clump instability in a one-dimensional, ion—electron plasma is presented. Growth is predicted to occur in regions of velocity space where the average particle distribution functions have opposing velocity gradients. The free energy required for instability is significantly below the threshold necessary for the linear instability of ion acoustic waves. The growth rate increases with fluctuation amplitude and is proportional to the inverse of the nonlinear trapping

time. The effect of particle discreteness and clump self-energy on the growth rate is discussed. The growth rate is in reasonable agreement with recent particle simulations.

4095 **Magnetic reconnection driven by the coalescence instability.** Bhattacharjee, A.; Brunel, F.; Tajima, T. (Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712). *Physics of Fluids;* **26**: No. 11, 3332-3337(Nov 1983). Contract FG05-80ET53088.

A detailed study of magnetic reconnection at an X point driven by the coalescence instability is presented. In particular, the effects of plasma compressibility and the magnitude of the toroidal field on the rate of reconnection are explored. For large toroidal fields, the plasma is almost incompressible and the destruction of magnetic flux proceeds linearly with time. However, when the attractive force between two neighboring islands is strong, and when the poloidal and the toroidal fields are comparable in magnitude, the reconnection rate is found to be faster. Implications for the steady-state models of magnetic reconnection are discussed.

4096 **Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab.** Waltz, R.E.; Dominguez, R.R. (GA Technologies, Inc., San Diego, California 92138). *Physics of Fluids;* **26**: No. 11, 3338-3349(Nov 1983). Contract AT03-76ET51011.

Low-$\beta$ tokamaks have drift-wave density fluctuations (n/n) with the characteristics of strong turbulence. To describe their spectra, earlier work [Phys. Fluids 26, 169 (1983)] with simple wave—wave nonlinear coupling models in two dimensions is extended to more physical electrostatic models for drift waves in three dimensions. The electrons are treated with a linear nearly Boltzmann response. The cold ions have nonlinear cross-field drift motion and linear parallel motion. Numerical methods based on the direct interaction approximation are applied to both wave—wave and wave—particle nonlinear effects, and the spectral intensity I/sub k//sub x/k/sub y/k/sub parallel/$\omega$ [n/n = (rho/sub s//L/sub n/)I$^1$/sup //$^2$] for a sheared slab is calculated. The shear causes a linear coupling of adjacent k/sub x/ and k/sub parallel/ modes. A suggested extension to toroidal geometry is made. Many similarities with experiments are found: Iperpendicular is nearly isotropic in k/sub perpendicular/ and peaked at k/sub perpendicular/rho/sub s/ <O(1/3). Ion Compton scattering damps at large k/sub perpendicular/rho/sub s/ and parallel ion motion provides critical damping at low k/sub y/ rho/sub s/. Here I$^1$/sup //$^2$ ~O(3) is weakly dependent on the linear driving rate $\gamma$ and best summarized by the mixing length model: n/n~1/k/sub x/L/sub n/ with D~$\gamma$/k$^2$/sub x/.

4097 **Reduced magnetohydrodynamics and the Hasegawa—Mima equation.** Hazeltine, R.D. (Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712). *Physics of Fluids;* **26**: No. 11, 3242-3245(Nov 1983). Contract FG05-80ET53088.

Reduced magnetohydrodynamics consists of a set of simplified fluid equations which has become a principal tool in the interpretation of plasma fluid motions in tokamak experiments. The Hasegawa—Mima equation is applied to the study of electrostatic fluctuations in turbulent plasmas. The relations between these two nonlinear models is elucidated. It is shown that both models can be obtained from appropriate limits of a third, inclusive, nonlinear system. The inclusive system is remarkably simple.

4098 **Magnetic surface waves in plasmas.** Jones, R.D. (Applied Theoretical Physics Division, Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Physical Review Letters;* **51**: No. 14, 1269-1271(3 Oct 1983).

The existence of a new type of surface wave in plasmas is demonstrated. These waves are intimately connected with the self-generation of magnetic fields in the laser-plasma interaction. The waves resemble waveguide modes in that a number of discrete modes can exist. The modes are localized to within a collisionless skin depth of the surface and, in the collisionless fluid limit, there is no restriction on the distance the waves can propagate.

4099 **Potentials in thermal barriers with strong electron-cyclotron heating.** Cohen, R.H. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physics of Fluids;* **26**: No. 10, 2774-2777(Oct 1983). Contract W-7405-ENG-48.

Expressions for the potential difference Phi/sub p/b between the plug and barrier regions of a tandem-mirror thermal barrier cell are derived in the limit of strong electron-cyclotron heating. It is found that Phi/sub p/b varies as the 2/3 power of the ratio of the density of electrostatically trapped plug electrons to the density of thermal electrons at the barrier. Electric-field requirements for validity of the solutions are presented.

4100 **Numerical solution of the electron distribution function in tandem-mirror thermal barriers.** Matsuda, Y.; Rognlien, T.D. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physics of Fluids;* **26**: No. 10, 2778-2780(Oct 1983). Contract W-7405-ENG-48.

The relativistic Fokker—Planck equation is solved with electron cyclotron resonance heating (ECRH) in a magnetic mirror for an assumed thermal barrier electrostatic potential profile. Two methods: a finite element technique and a Monte Carlo technique: give nearly the same results. Favorable comparison is made with recently obtained analytical expressions for the relation between axial density ratios and potential profile using parameters expected in the TMX-U and MFTF-B experiments.

4101 **Survey of free-boundary ion ring equilibria.** Ruchti, C.B. (Department of Applied Physics, Cornell University, Ithaca, New York 14853). *Physics of Fluids;* **26**: No. 10, 3092-3095(Oct 1983). Contract AC02-76ET53017.

A systematic survey is made of free-boundary, large-orbit ion ring equilibria for the case where the distribution function is narrowly peaked at a given value of the single-particle energy (H) and the canonical angular momentum (P/sub theta/). Suitably normalized, such equilibria depend on only two free parameters. The survey covers essentially all of the parameter space where field-reversed equilibria exist. Results are presented as contour plots in the (P-bar, H-bar) plane of various physical quantities. The results may be reinterpreted so as to apply to relativistic electron rings on which there are experimental observations.

4102 **Pulsed plasma source spectrometry in the 80—8000-eV x-ray region.** Henke, B.L.; Yamada, H.T.; Tanaka, T.J. (Department of Physics and Astronomy, University of Hawaii, Honolulu, Hawaii 96822). *Review of Scientific Instruments;* **54**: No. 10, 1311-1330(Oct 1983). Contract AS08-81DP40153.

The general characteristics are compared for the plane, convex, and concave fixed crystal analyzers which may be applied to the spectrometry of concentrated, intense plasma sources of x radiation involved, for example, in fusion energy and x-ray laser research. The unique advantages of the elliptical analyzer for precise and absolute spectral measurements are noted and detailed descriptions of its geometrical and physical optics are presented. With a source point at one of the foci of the elliptical analyzer profile, the spectrum is Bragg reflected ($45° < 2\theta < 135°$) at normal incidence upon a detection circle with its center at the second focal point, at which an effective scatter aperture and filter window is located. A primary monochromator consisting of a cylindrical, grazing-incidence mirror is placed between the source and the analyzer to provide an efficient cutoff for high-order diffracted background radiation and to focus the divergent rays so as to obtain an adjustable spectral line length at the detection circle. Photographic film may be transported along the detection circle. Linear position-sensitive electronic detection arrays or a streak camera slit window may be placed along a chord of the detection circle. Calibration procedures for absolute line and continuum intensity measurement are described and examples of calibrating spectra are presented as measured with elliptical analyzers of LiF, PET, KAP, and molecular multilayers for the 80—8000-eV photon energy region. The instrumental effects that contribute to the spectral line shape as measured by the elliptical analyzer spectrograph are defined and a simple

line-shape analysis procedure is presented for the determination of the line-broadening contributions of the source.

4103 **Plasma spectral analysis using an image dissecting detector.** Weber, P.G. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Review of Scientific Instruments;* **54**: No. 10, 1331-1333(Oct 1983).

We describe the adaptation of an image dissecting detector to a visible/near-ultraviolet radiation spectrometer used in laboratory plasma diagnostics. The detector has advantages in terms of sensitivity, fast scanning capability, and versatility over other detectors. We demonstrate several plasma diagnostics applications for the system.

4104 **Scanning microwave interferometer for ELMO bumpy torus.** Uckan, T. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Review of Scientific Instruments;* **54**: No. 10, 1420-1421(Oct 1983). Contract W-7405-ENG-26.

A simple 4-mm scanning microwave interferometer has been developed and employed for electron density profile measurements on the ELMO bumpy torus (EBT). By making use of a pair of horizontally moving 45° mirrors that are located at the top and bottom of the plasma volume, the system avoids the deleterious effects of plasma sputtering and wall material flaking, since the microwave transmission and receiving horns do not view the plasma directly.

4105 **Technique to increase the $H^+$ ion fraction in a multicusp source.** Ehlers, K.W.; Leung, K.N. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Review of Scientific Instruments;* **54**: No. 10, 1296-1299(Oct 1983). Contract AC03-76SF00098.

It is possible to filter out the primary ionizing electrons from the ion extraction region of a multicusp source by installing the filament inside the dipole fields of the permanent magnets and thereby enhance the $H^+$ ion species in the extracted beam. An optimum position of the filament has been determined such that a quiescent plasma together with a uniform plasma density profile across the extraction plane can be obtained.

4106 **Finite-larmor-radius magnetohydrodynamic equations for microturbulence.** Hasegawa, A.; Wakatani, M. (Bell Laboratories, Murray Hill, New Jersey 07974). *Physics of Fluids;* **26**: No. 10, 2770-2772(Oct 1983). Contract AC02-76ET53016.

A set of nonlinear fluid equations which includes the effect of finite ion Larmor radius is derived to describe microturbulence [k/sub perpendicular/ rho/sub s/ ≃O(1), k/sub parallel/R≃O(1), $n_1/n_0$≃ rho/sub s//L/sub n/, and $B_1/B_0$≃rho/sub s//R ] in an inhomogeneous plasma with a strong magnetic field of general geometry. Here rho/sub s/ is the ion Larmor radius at the electron temperature, L/sub n/ is the density gradient scale length, R is the radius of curvature of the magnetic line of force, k is the wave vector, and $n_1/n_0$ and $B_1/B_0$ are relative levels of density and magnetic field perturbations.

4107 **Electrostatic Kelvin—Helmholtz instability in a radially injected plasma cloud.** Sydora, R.D.; Wagner, J.S.; Lee, L.C.; Wescott, E.M.; Tajima, T. (Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701). *Physics of Fluids;* **26**: No. 10, 2986-2991(Oct 1983). Contract FG05-80ET53088.

An electrostatic finite-sized particle simulation model is used to study the early time-scale phenomena associated with an impulsively injected plasma, expanding radially, normal to a strong ambient magnetic field. Results of the simulation show the early formation of a radial polarization electric field due to ion—electron charge separation which causes electrons to drift in the azimuthal direction. Velocity shear within this motion gives rise to a Kelvin—Helmholtz (diocotron) instability, creating a radial fluted pattern as the plasma expands. In the nonlinear stage of instability, azimuthal variations in the electric field are observed which cause electrons to drift across the magnetic field, thereby reducing the space charge created by energetic ion expansion. The results of a linear stability analysis reveal that for a decreasing amount of charge separation in the plasma, the number of unstable azimuthal modes at maximum growth rate increases. Also, as the thickness of the electron ring increases, a fewer number of unstable modes develops for a given amount of charge separation. It is concluded that electrons become unstable at the very early time scale, within an ion gyroperiod, and that unstable electrons lead to modification of the ion dynamics.

4108 **Weak cubic Langmuir turbulence.** Hansen, P.J.; Nicholson, D.R. (University of Iowa, Iowa City, Iowa 52242). *Physics of Fluids;* **26**: No. 10, 3008-3017(Oct 1983). Contract AC02-82ER53136.

The cubically nonlinear Schroedinger equation model of Langmuir turbulence is solved in the weak turbulence limit. Steady-state power-law solutions for the energy spectra are found in arbitrary dimensionality. In one spatial dimension, the theory incorrectly predicts that no spectrum evolves in time. In three spatial dimensions, numerical solutions are obtained for the undriven, undamped, initial value problem and for the driven, damped, initial value problem.

4109 **Space-time evolution of the beam-plasma instability.** Jones, M.E.; Lemons, D.S.; Mostrom, M.A. (Advanced Concepts and Plasma Applications Group Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physics of Fluids;* **26**: No. 10, 2784-2786(Oct 1983).

Particle-in-cell simulations of the beam-plasma instability confirm that the behavior of the interaction can be described as a wave packet that continually grows in both space and time. A consequence is that the energy deposition length of the instability becomes shorter in time, offering increased potential for this interaction to be used as an inertial fusion driver.

4110 **Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks.** Takase, Y.; Porkolab, M. (Department of Physics and Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physics of Fluids;* **26**: No. 10, 2992-3003(Oct 1983). Contract AC02-78ET51013.

Parametric decay of a lower-hybrid pump wave into another lower-hybrid wave and a low-frequency ion-sound quasimode (ω/sub R/roughly-equalk/sub parallel/v/sub t/i) is studied. Such an instability may be excited during high-power lower-hybrid heating experiments in tokamak plasmas and may lead to strong modification of the incident n/sub parallel/ spectrum near the plasma periphery. Such an instability could explain the broadened and downshifted frequency spectrum and phase-independent heating observed in the Alcator A tokamak experiments. Although the growth rate for this decay increases like $\gamma+\Gamma_2$proportional$E^2_0$ for powers slightly above threshold ($\Gamma_2$ is the linear damping rate at the lower sideband and $E_0$ is the pump electric field), for powers well above threshold (such that $\gamma >$ or ≃ω/sub R/)γproportionalE/sup 2/3/$_0$, and the convective thresholds are rather high. However, for inaccessible n/sub 0parallel/, the pump wave power is expected to accumulate on the outer surface of the plasma column where the growth rate is large and the convective thresholds are significantly reduced. In such a case the threshold pump power can become quite low and may be exceeded in experiments such as Alcator A.

4111 **Ballooning modes in quadrupole tandem mirrors.** Kaiser, T.B.; Pearlstein, L.D. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physics of Fluids;* **26**: No. 10, 3053-3065(Oct 1983). Contract W-7405-ENG-48.

Ballooning modes in tandem mirrors with quadrupole vacuum field symmetry are investigated in the limits of zero gyroradius and large aspect ratio. The eigenmode equation derived from the guiding-center energy principle is reduced to one dimension by the use of an eikonal representation of the cross-field variation of the perturbation. The eigenvalue problem is solved numerically and the structure of the local dispersion relation examined in order to derive conditions for marginal stability. Applications to the TMX-U and MFTF-B tandem-mirror experiments are presented.

4112 **Application of the stellarator expansion for plasma stability studies in stellarators.** Anania, G.; Johnson, J.L. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 10, 3070-3078(Oct 1983). Contract AC02-76CH03073.

A numerical code, which utilizes the stellarator expansion, is developed and tested. It is used to investigate the magnetohydrodynamic stability properties of several stellarator configurations, including Heliotron E, Wendelstein VII-A, a modular-coil device, and ATF-1.

4113 **Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability.** Tsang, K.T.; Lee, X.S.; Catto, P.J. (Science Applications, Inc., Plasma Research Institute, Boulder, Colorado 80302). *Physics of Fluids;* **26**: No. 10, 3079-3084(Oct 1983). Contract AC03-76ET53057.

The effect of the anisotropic pressure of a hot-electron plasma on ballooning-interchange and compressional-Alfven modes is investigated. General eigenmode equations for these modes are derived in the eikonal and high phase velocity limits with finite gyroradius effects retained. A local dispersion relation is obtained in the flute limit for an isotropic Maxwellian background plasma with a bi-Maxwellian hot-electron population. Stability is investigated both analytically and numerically for this high phase velocity and/or high precessional frequency model.

4114 **Role of the hot-electron distribution function in the stability of the ELMO Bumpy Torus.** Nguyen, K.; Kammash, T. (The University of Michigan, Ann Arbor, Michigan 48109). *Physics of Fluids;* **26**: No. 10, 3085-3091(Oct 1983).

Several recent studies of ELMO Bumpy Torus (EBT) stability show that conflicting results can emerge when different distribution functions for the hot-electron component are used. In this paper the role of the distribution function is established by examining the stability of various modes with the aid of two models. In the "slab" model where the magnetic field curvature is simulated by a gravitational force it is shown that the stability of the compressional Alfven wave is insensitive to the distribution function while the interacting interchange mode is sensitive. In the "local" approximation in which the curvature effects enter in a natural way it is seen that the interchange modes are insensitive so long as the anisotropy of the hot electrons is large, while other modes reflect dependence on the distribution function. Finally it is demonstrated that in the "deep well' case the results for both modes are independent of the model and of the distribution function.

4115 **Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid.** Colombant, D.G.; Manheimer, W.M. (Plasma Physics Division, Naval Research Laboratory, Washington, DC 20375). *Physics of Fluids;* **26**: No. 10, 3127-3130(Oct 1983).

The reduction in Rayleigh—Taylor instability growth rate because of density inhomogeneity in an incompressible ablatively accelerated plasma is calculated over a very wide range of physical parameters. In the low-wavenumber regime, the effect of the density gradient is to give a significant (about a factor of 2) reduction in growth rate as seen in fluid simulations.

4116 **Echo phenomenon associated with lower-hybrid wave launching.** Wong, K.L.; Skiff, F.; Ono, M. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 10, 2772-2774(Oct 1983). Contract AC02-76CH03073.

Lower-hybrid waves at two different frequencies $f_1$ and $f_2$ are launched simultaneously from two localized antennas, and a third wave is observed to arise near the plasma edge at the frequency $f = f_2 - f_1$. This phenomenon can be explained by an echo effect near the plasma surface.

4117 **Theory of mode-induced beam particle loss in tokamaks.** White, R.B.; Goldston, R.J.; McGuire, K.; Boozer, A.H.; Monticello, D.A.; Park, W. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 10, 2958-2965(Oct 1983). Contract AC02-76CH03073.

Large-amplitude rotating magnetohydrodynamic modes are observed to induce significant high-energy beam particle loss during high-power perpendicular netural beam injection on the poloidal divertor experiment (PDX). A Hamiltonian formalism for drift orbit trajectories in the presence of such modes is used to study induced particle loss analytically and numerically. Results are in good agreement with experiment.

4118 **Analytical approximations for the electron cyclotron absorption coefficient at the fundamental frequency in the Doppler regime.** Celata, C.M. (Physics Department, Dartmouth College, Hanover, New Hampshire 03755). *Physics of Fluids;* **26**: No. 10, 3029-3037(Oct 1983).

The index of refraction and the electron cyclotron absorption coefficient at ωroughly-equalo/sub c/ in the Doppler regime are examined for a plasma in thermal equilibrium. Regimes where the known analytical approximations fail are quantitatively delineated. The exact numerical solution to the dispersion relation is given in the regimes where known analytical theory fails.

4119 **Ballooning mode spectrum in general toroidal systems.** Dewar, R.L.; Glasser, A.H. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 10, 3038-3052(Oct 1983). Contract AC02-76CH03073.

A WKB formalism for constructing normal modes of short-wavelength ideal hydromagnetic, pressure-driven instabilities (ballooning modes) in general toroidal magnetic containment devices with sheared magnetic fields is developed. No incompressibility approximation is made. A dispersion relation is obtained from the eigenvalues of a fourth-order system of ordinary differential equations to be solved by integrating along a line of force. Higher-order calculations are performed to find the amplitude equation and the phase change at a caustic. These conform to typical WKB results. In axisymmetric systems, the ray equations are integrable, and semiclassical quantization leads to a growth rate spectrum consisting of an infinity of discrete eigenvalues, bounded above by an accumulation point. However, each eigenvalue is infinitely degenerate. In the nonaxisymmetric case, the rays are unbounded in a four-dimensional phase space, and semiclassical quantization breaks down, leading to broadening of the discrete eigenvalues and the accumulation point of the axisymmetric unstable spectrum into continuum bands. Analysis of a model problem indicates that the broadening of the discrete eigenvalues is numerically very small, the dominant effect being broadening of the accumulation point.

4120 **Reduced equations for internal kinks in tokamaks.** Izzo, R.; Monticello, D.A.; Strauss, H.R.; Park, W.; Manickam, J.; Grimm, R.; DeLucia, J. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 10, 3066-3069(Oct 1983). Contract AC02-76CH03073.

A reduced set of ideal magnetohydrodynamic equations is derived for large-aspect-ratio, low-$\beta$ tokamaks that adequately describes the linear and nonlinear evolution of ideal internal kink modes in tokamaks.

4121 **Dispersion relation for a relativistic electron beam in a plasma.** Shoucri, M. (Production et Conversation d'energie, Institut de Recherche d'Hydro-Quebec, Varennes J0L 2P0, Quebec, Canada). *Physics of Fluids;* **26**: No. 10, 3096-3097(Oct 1983).

The dispersion relation for a relativistic electron beam in a plasma, in the absence of an external magnetic field, is derived. It is shown that the plasma oscillations excited by the beam are linearly coupled to the electromagnetic TM mode.

4122 **Inhomogeneous two-plasmon instability.** Simon, A.; Short, R.W.; Williams, E.A.; Dewandre, T. (Laboratory for Laser Energetics, University of Rochester, Rochester, New York 14623). *Physics of Fluids;* **26**: No. 10, 3107-3118(Oct 1983). Contract AC08-80DP40124.

The two-plasmon instability in warm inhomogeneous plasma for a normally incident pump is considered. The complex eigenfrequencies of the absolute instability are obtained by reducing the linearized fluid equations to a Schroedinger equation in wavenumber space. These eigenvalues are obtained in several ways. One is by combining a perturbation expansion in powers of the reciprocal scale length with WKB theory. The resulting algebraic equations are solved by three analytical approximations and by direct numerical solution. A second way is by analysis of the Schroedinger equation using an interactive WKB computer code. A third way is by the use of a shooting code. These methods are all used and compared for threshold curves and growth rates above threshold. Some eigenfunction forms are also obtained. The threshold is near ($v_0$/v/sub e/)$^2$$k_0$ L = 3, and varies weakly with $\beta \simeq v^4$/sub e//$v^2{}_0c^2$, rising from near 2 to about 4 over six decades of variation of $\beta$. The corresponding critical value of (k/sub y//$k_0$)$^2$ is near 0.2/$\beta$ over this range. Above threshold, there is a smooth variation of the growth rate with (k/sub y//$k_0$)$^2$, peaking at some intermediate value. The perturbation method is in good agreement there with more exact calculations. Experimental implications of these results are discussed.

4123 **Stimulated Brillouin backscattering in long-scale-length plasmas.** Colombant, D.G.; Manheimer, W.M.; Gardner, J. (U. S. Naval Research Laboratory, Washington, DC 20375). *Physics of Fluids;* **26**: No. 10, 3148-3155(Oct 1983).

Stimulated Brillouin backscattering in long-scale-length plasmas is calculated using a wave kinetic model. In these calculations use is made of computed hydrodynamic profiles for these plasmas. Results are presented for the parameters of the joint Naval Research Laboratory—Lawrence Livermore National Laboratory experiments and for reactor size pellets of 5 mm characteristic length. Means of reducing high levels of backscattering for the latter case are investigated.

4124 **Experimental study of high-beta tokamak stability.** Machida, M.; Navratil, G.A. (Columbia University, New York, New York 10027). *Physical Review Letters;* **51**: No. 11, 992-995(12 Sep 1983). Contract AC02-76ET53016.

The stability properties of high-beta tokamak equilibria with $\epsilon\beta$/sub p/$>$ or $\simeq 1$ and $<\beta>$ in the range of 10% have been studied with use of a dual-beam $CO_2$-laser interferometer system. Two equilibria with $<\beta>$ of 9% and 13% were observed to be stable. Another equilibrium with $<\beta>$ of 10% was observed to be unstable with the characteristics of a high—toroidal-mode-number ballooning mode.

4125 **Instability of fusing plasmas and spin-depolarization processes.** Coppi, B.; Pegoraro, F.; Ramos, J.J. (Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Physical Review Letters;* **51**: No. 10, 892-895(5 Sep 1983).

A plasma mode driven by the anisotropy of the velocity distribution of charged fusion-reaction products can resonate with the spin precession frequency of one of the plasma components. When these spins are initially polarized, resonant depolarization can occur at a rate considerably faster than the fusion reaction rate, if spatial inhomogeneity effects do not depress excessively the mode amplitude.

4126 **Nonlinear coupling of drift waves, convective cells, and magnetic drift modes in finite-$\beta$ plasmas.** Rahman, H.U.; Weiland, J. (Institute for Electromagnetic Field Theory and EURATOM Fusion Research (EUR-EFN), Chalmers University of Technology, S-41296 Goeteborg, Sweden). *Physical Review [Section] A: General Physics;* **28**: No. 3, 1673-1678(Sep 1983).

A set of three coupled nonlinear equations describing electrostatic drift waves, drift Alfven waves, convective cells, and magnetic drift modes has been derived for finite ion temperature. The reduction to simplified nonlinear model equations in different $\beta$ regimes and the consequences for transport properties are discussed.

4127 **Direct implicit large time-step particle simulation of plasmas.** Langdon, A.B.; Cohen, B.I.; Friedman, A. (University of California, Lawrence Livermore National Laboratory, Livermore, California 94550). *Journal of Computational Physics;* **51**: No. 1, 107-138(Jul 1983). Contract W-7405-ENG-48.

A recently developed implicit method for solving the set of coupled particle and field equations arising in particle-in-cell plasma simulation is described in detail. This implicit integration scheme is motivated by the desire to study efficiently low-frequency, long-wavelength plasma phenomena using a large time step. In particular, this method allows the use of a time step which larger than the electron plasma period, when electron plasma oscillations are not of interest, and provides selective damping of the distorted remnant of the electron plasma oscillation. The implicit scheme presented here uses particle data directly without introducing fluid moment equations as an intermediary between the field and particle equations. In an electrostatic model, the essence of our scheme is a linearization of the charge density at the advanced time about an explicit approximate density and the computation of the incremental correction to the charge density that is linear in the advanced field. We are led to an elliptic field equation whose coefficients depend directly on particle data accumulated on the spatial grid in the form of an effective linear susceptibility. Prediction and iterative refinement of the solution of the implicit equations, and spatial difference representations of the equations are given. Residual restrictions on time step are described. It is demonstrated that convergence is superior when spatial differencing and filtering are done in a consistent manner.

4128 **Absorption of radiation propagating obliquely in a magnetoplasma.** Khandker, A.; O'Connell, R.F.; Ford, G.W. (Department of Physics and Astronomy, Louisiana State University). *Astrophysical Journal;* **269**: No. 2, 668-670(15 Jun 1983). Contract AS05-79ER10459.

We consider the propagation of electromagnetic radiation in a magnetoplasma, with the propagation vector making an arbitrary and $\theta$ with respect to the magnetic field, and we obtain a general expression for the power absorbed. In the particular case of propagation of circularly polarized radiation, we find that, for all angles, left circularly polarized radiation is absorbed more than right circularly polarized radiation. We discuss the implications of our results for the deduction of the magnitude of the magnetic field in magnetic white dwarfs.

4129 **Computations in plasma physics.** Cohen, B.I.; Killeen, J. (Lawrence Livermore National Laboratory). *Physics Today;* **36**: No. 5, 54-63(May 1983). Contract W-7405-ENG-48.

Computers of all sizes are assisting in theoretical calculations of increasing sophistication and precision, and in the design, direction and analysis of experiments.

4130 **Order of the linear instability of a plasma.** Larsen, E.W.; Burnap, C.; Zweifel, P.F. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Transport Theory and Statistical Physics;* **12**: No. 1, 73-79(Jan 1983). Contract AS05-80ER10711.

We derive a simple condition that determines the order, in perturbation theory, of the linear instability of a plasma.

4131 **High-power ICRF and ICRF plus neutral-beam heating on PLT.** Hwang, D.; Bitter, M.; Budny, R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 3-15 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/I-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

PLT ICRF experiments with RF powers up to approx.=3 MW have demonstrated efficient plasma heating in both the minority fundamental and the second harmonic ion-cyclotron regimes. In the minority $^3$He regime, ion temperatures of approx.=3 keV have been produced along with approx.=1 kW of D-$^3$He fusion power and substantial electron heating. In the second harmonic H regime, an equivalent averaged ion energy of approx.=4 keV has been achieved. Combined ICRF plus neutral-beam heating experiments with auxiliary powers totalling up to 4.5 MW have provided insight into auxiliary heating performance at stored plasma energy levels up to approx.=100 kJ. Values of $\beta$sub(phi) in the range of 1.5-2% have been attained for Bsub(phi) approx.=17 kG. Energetic discharges with n-barsub(e) up to approx.6x10$^{13}$ cm$^{-3}$ at Bsub(phi) approx.=28 kG have also been investigated. Preliminary confinement studies suggest that energetic ion losses may contribute to a direct loss of the input RF power in the H minority heating regime but are insignificant in the $^3$He minority case. The energy confinement time for the H minority regime is reduced somewhat from the Ohmic value.

4132 **Equilibrium, stability and heating of plasmas in linear and toroidal Extrap pinches.** Bonnevier, B.; Drake, J.R. (Royal Inst. of Tech., Stockholm (Sweden)); Dalhed, H.E. (Lawrence Livermore National Lab., CA (USA)). pp 135-141 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/J-5).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The Extrap scheme consists of a Z-pinch immersed in an octupole field. The total magnetic field has no component along the pinch axis. Globally stable Z-pinch equilibria with a distributed plasma current density and a duration of about 100 Alfven transit times have been observed in linear and toroidal sector experiments. Theoretical studies indicate that this stability can be the result of constraints introduced by the octupole field and the resulting separatrix of the total field, in combination with finite-Larmor-radius effects. A scheme for ICRF heating of the plasma in configurations with a magnetic neutral line, being applicable to Extrap and FRC, is analysed. Wave propagation arises owing to the Hall effect. Particle resonances are responsible for the absorption, owing to a high parallel wavenumber and a weak magnetic field.

4133 **High-beta neoclassical current and stability experiments.** Callen, J.D.; Dexter, R.N.; Fortgang, C.M. (Wisconsin Univ., Madison (USA). Dept. of Physics). pp 143-150 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/J-6).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Equilibrium neoclassical plasma currents and plasma stability at high values of beta have been studied in the Levitated Toroidal Octupole. In a collisionality regime at the border between the banana and plateau regimes, the bootstrap and Pfirsch-Schlueter currents have for the first time been experimentally observed in agreement with neoclassical theory. Also, stable plasmas have been produced with extremely high beta values (2.5 times the MHD ballooning instability beta limit) and compared with the results of a kinetic stability calculation, implicating finite-ion-gyroradius effects as a possible cause for the observed stability. To augment both the bootstrap current and stability studies, four megawatts of ion cyclotron resonance heating power are being optimized.

4134 **Fusion reactor plasmas with polarized nuclei.** Kulsrud, R.M.; Furth, H.P.; Valeo, E.J.; Budny, R.V.; Jassby, D.L.; Micklich, B.J.; Post, D.E. (Princeton Univ., NJ (USA). Plasma Physics Lab.); Goldhaber, M. (Brookhaven National Lab., Upton, NY (USA)); Happer, W. (Princeton Univ., NJ (USA)). pp 163-173 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/K-2).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

New techniques of bulk polarization could be used to fuel a reactor with polarized hydrogenic atoms so as to form a plasma of polarized nuclei. Theoretical calculations indicate that, once the nuclei of the plasma are polarized in some preferred state, they can maintain this state with a probability near 100% during their lifetime in the reactor, including possible recycling. There are a number of practical advantages to be gained from the use of polarized plasma in a fusion reactor. The nuclear reaction rates can be increased or decreased and/or the direction of emission of the reaction products can be controlled. The D-T reaction rate can be enhanced by as much as 50%, with the reaction products emitted perpendicular to the magnetic field. Alternatively, it is possible to direct the reaction products primarily along the field, with no enhancement. In the case of the D-D reaction, the theoretical predictions are somewhat less certain. Enhancement of the reaction rate by a factor of 1.5 to 2.5 is to be expected. In a different polarization state, suppression of D-D reactions may be feasible - a possibility that would be of interest for a "neutron-free" D-$^3$He reactor. A quantitative discussion of the relevant nuclear physics as well as of the various mechanisms producing depolarization is given.

4135 **Curvature-driven trapped-particle modes in tandem mirrors.** Berk, H.L.; Rosenbluth, M.N. (Texas Univ., Austin (USA). Inst. for Fusion Studies); Wong, H.V. (Texas Univ., Austin (USA). Fusion Research Center); Antonsen, T.M. Jr. (Maryland Univ., College Park (USA). Dept. of Physics and Astronomy); Baldwin, D.E. (Lawrence Livermore National Lab., CA (USA)); Lane, B. (Massachusetts Inst. of Tech., Cambridge (USA)). pp 175-182 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/K-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The variational structure of the plasma linear response function is used to demonstrate the relation of magnetohydrodynamic (MHD) and trapped-particle instabilities. Although in most systems, where bending energy stabilizes ballooning modes, trapped-particle instabilities have a low growth rate, in tandem mirrors with thermal barriers the trapped-particle instability growth rate can approach that of MHD instabilities. In addition, the kinetic theory yields stabilizing effects due to the difference in electron and ion orbits and destabilizing effects due to the variation of the E-vector x B-vector drift along a field line.

4136 **Plasma properties and ion heating in EBT-S and hot electron rings at TRW.** Baity, F.W.; Berry, L.A.; Bighel, L. (Oak Ridge National Lab., TN (USA)). pp 185-196 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/L-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The ELMO Bumpy Torus-Scale (EBT-S) has been heated by up to 200 kW of 28-GHz microwave power. Application of this

power has greatly extended the operating regime of interest and has allowed scaling over a wider range of plasma temperature and density. Electron temperatures of about 1 keV have been reached at densities of 0.5-2x10$^{18}$ m$^{-3}$. Electron confinement is approximately classical, with tausub(E) approx.= 2-5 ms. Impurity densities are low, and impurity radiation represents a negligible power loss. Ion heating has been observed with RF in the range 15-50 MHz. High-$\beta$ electron rings provide MHD stability to EBT-S. Measured values of the energy loss agree with calculated values to within a factor of 4, which is within the combined error limits of the calculations and other observations. Multiple-frequency ring formation has been studied in the simple mirror device SM-1, and with this technique four-fold increases in the ring stored energy have been observed. These results have been extended in the five-cell STM-1 device to include the formation of hot electron discs and ring-disc combinations. In addition, ion-cyclotron heating of a streaming plasma has been shown to give a large increase in the stored energy in STM-1.

4137 **Experimental studies of field-reversed configuration confinement in FRX-C.** Siemon, R.E.; Armstrong, W.T.; Bartsch, R.R. (Los Alamos National Lab., NM (USA)). pp 283-292 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/M-2-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

A primary purpose of the large-bore (0.5 m dia.) FRX-C field-reversed theta-pinch experiment is to study the scaling of plasma particle containment time tausub(N) with major radius R of the field-reversed configuration (FRC). At 20 mtorr fill pressure the FRX-C plasma parameters, n-bar approx.=4x10$^{15}$ cm$^{-3}$, Tsub(e) approx.=100 eV, Tsub(i) approx.=150 eV, are comparable to those obtained in the smaller bore (0.25 m dia.) FRX-B device. Under these conditions, the present measurement of particle confinement time in FRX-C is tausub(N) approx.=140 $\mu$s, consistent with the scaling tausub(N) is proportional to R$^2$, when compared with the earlier FRX-B results. This favourable scaling has been observed with R/rhosub(i) approx.=30 (rhosub(i)=ion gyroradius), twice as large as in FRX-B, despite theoretical indications that various MHD instabilities would appear as R/rhosub(i) was increased. The characteristics of hotter neutron-generating FRC plasma produced at lower fill pressure (5 mtorr), where n-bar approx.=2x10$^{15}$ cm$^{-3}$, Tsub(e) approx.=170 eV, Tsub(i) approx.=600 eV, are also presented. In this plasma regime an accurate determination of tausub(N) is difficult because of the short stable period observed.

4138 **High-beta tokamak plasma physics studies.** Chu, C.K.; Deniz, A.V.; Elkin, D.J. (Columbia Univ., New York (USA). Plasma Physics Lab.). pp 321-329 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/M-5-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Experimental and theoretical research at Columbia University on the physics of high-beta tokamaks is summarized. Data obtained from multipoint Thomson scattering and multichannel magnetic probes show $\beta_0$ approx.=42%, $<\beta>$ approx.=13%, nsub(e)(0) approx.=2x10$^{21}$ m$^{-3}$, and Tsub(e) approx.=80 eV. A toroidal diamagnetic well is clearly observed as well as an outward shift in the peak of the pressure profile, amounting to 40% of the minor radius and indicating epsilon$\beta$sub(p)>1. Growing density fluctuations characteristic of low-n MHD instability are observed on the outer (large major radius) edge of the pressure profile. Spectroscopic measurements of poloidal and toroidal flows indicate a velocity of about 1.6x10$^6$ cm.s$^{-1}$ in each direction. Simulation of the formation and equilibrium of Torus II are described, as well as a more general treatment of high-beta tokamak stability from bifurcation theory.

4139 **Theory and simulation of RF heating and current drive.** Dawson, J.M.; Fried, B.D.; Morales, G.J.; Lin, A.T.; Decyk, V.K.; Caplan, M. (California Univ., Los Angeles (USA). Dept. of Physics). pp 595-602 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (IAEA-CN—41/V-9; CONF-820930—).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Four topics in RF heating and current drive are discussed. (1) Single-particle ICRH in a strongly inhomogeneous magnetic field, with constant inverse scale length of order of the ion cyclotron radius was studied. Because the ion cyclotron frequency is energy-dependent, there is no time-averaged energy gain unless the RF field amplitude exceeds a critical value Esub(c), above which the multiple resonances, arising from the anharmonicity of the motion, overlap, resulting in stochastic heating. (2) An extraordinary ECRH wave launched from the high field side with large angle of incidence is observed to convert completely into a backward electrostatic Bernstein wave at the upper hybrid layer. The mode-converted wave deposits its energy to the electrons at the electron cyclotron layer through resonant interactions dominated first by the Doppler broadening and later by the relativistic mass correction. (3) An electrostatic particle simulation code is used to study heating and current generation with lower-hybrid waves. The heating simulations are designed to examine the propagation of lower-hybrid waves with finite amplitude in an inhomogeneous medium and the mechanisms by which wave energy is absorbed. The current drive simulations examine the dynamics of current generation for a given initial electron velocity distribution and antenna profile. (4) To model gyrotron oscillators and amplifiers, an adaptation of a 1-2/2D finite-size particle code has been developed which allows interaction circuits with arbitrary wall profiles. The code was used to design and analyse a 60 GHz 270 kW gyrotron oscillator built by Hughes Aircraft Co. for ECRH heating of plasmas. Good agreement was obtained between simulation and experiment.

4140 **Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies.** Anania, G.; Grimm, R.C.; Ho, D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 603-612 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (IAEA-CN—41/V-10; CONF-820930—).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

(I) Equilibrium and stability studies using the stellarator expansion: the stellarator expansion reduces the three-dimensional MHD equations to two-dimensional ones and is applied to a model of Heliotron E. (II) Electron transport studies using the stellarator expansion: the stellarator expansion makes possible an estimate of "superbanana" electron heat transport. (III) Toroidal stellarator equilibria: it is shown how the vertical field, which produces no net body force, can shift vacuum flux surfaces and centre an equilibrium. (IV) Ballooning-mode equations for stellarators: ideal MHD ballooning-mode equations are derived for stellarators in the stellarator expansion. (V) Numerical studies of zero-net-current torsatrons: a fully three-dimensional computer code, based on an ideal MHD model, has been used to find stellarator configurations with finite critical values of the plasma parameter $\beta$. (VI) Low-shear stellarator studies: configurations whose magnetic axes are three-dimensional curves are studied; low-shear systems are considered for which the equilibrium and stability equations are simple; systems which have applied helical fields such as the Wendelstein stellarator are studied as well as configurations in which the rotational transform arises from geometry such as the figure-eight stellarator (in both cases families of equilibria are found, some of which are shown to be stable).

4141 **Theory of transport and heating in EBT.** Hedrick, C.L.; Batchelor, D.B.; Chen, G.L. (Oak Ridge National Lab., TN (USA)). pp 613-622 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (IAEA-CN—41/V-11; CONF-820930—).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Recent developments in neoclassical transport theory and heating for EBT are presented. The development of improved analytic expressions for both electron and ion transport coefficients is summarized as is their effect on the self-consistent ambipolar electric field. These new results lead to significant improvements in the comparison of theory and experiment. Detailed calculations of Electron Cyclotron Heating (ECH) in existing EBT devices which include wave absorption by the relativistic rings are discussed. Preliminary studies of Ion Cyclotron Heating (ICRH) are also presented. For both transport and heating theory, topics for further theoretical concentration are suggested.

4142 **Fully ionized and total silicon abundances in the Alcator-C tokamak.** Petrasso, R.; Seguin, F.H.; Loter, N.G.; Marmar, E.; Rice, J. (American Science and Engineering, Incorporated, Cambridge, Massachusetts 02139). *Physical Review Letters;* **49**: No. 25, 1826-1829(20 Dec 1982). Contract AC02-77ET53068;AC02-78ET51013.

With use of x-ray imaging arrays, spatially and temporally resolved measurements were made of fully ionized and total absolute Si (Z = 14) densities following injection of Si into Alcator C. The fully stripped ions were detected through x rays resulting from ground-state radiative recombination. Central ion densities were found to be close to coronal equilibrium values. In addition, radial profiles of fully ionized and H-like Si showed large fluctuations during internal disruptions. .ID LX2087 .PG 1830 1833

4143 **Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas.** Rhodes, C.K.; Carman, R.L. (University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Applied Optics;* **21**: No. 21, 3799-3800(1 Nov 1982).

Sharp autoionizing resonances (in this paper from He) used in conjunction with a spectrally bright XUV source of moderate power, e.g., laser produced plasma can greatly facilitate the coronal diagnostics of dense, high temperature, inertially confined fusion plasmas. (AIP)

4144 **Imaging x-ray spectrometer for laser fusion applications.** Ceglio, N.M.; Hawryluk, A.M.; Price, R.H. (University of California, Lawrence Livermore National Laboratory, P. O. Box 808, Livermore, California 94550). *Applied Optics;* **21**: No. 21, 3953-3960(1 Nov 1982).

A gold transmission grating has been coupled to a high-resolution Wolter-design grazing-incidence reflection x-ray microscope to produce an imaging x-ray spectrometer of unprecedented spatial resolution, spectral range, and collection solid angle. In a series of test experiments conducted at 1.75—2 keV, the instrument demonstrated a spectral resolving power, $\lambda/\Delta\lambda$, of 200 and a 1-D spatial resolution of 1 μm. The spectrometer's large collection solid angle, $\sim 2 \times 10^{-5}$ sr, and broad spectral range, from the near UV to 3.2 keV, make it a very versatile instrument for laser-fusion applications.

4145 **Neutral beam injector performance on the PLT and PDX tokamaks.** Schilling, G.; Ashcroft, D.L.; Eubank, H.P.; Grisham, L.R.; Kozub, T.A.; Kugel, H.W.; Rossmassler, J.; Williams, M.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 967-974 of Fusion technology 1980. Vol. 2. Oxford, England; Pergamon Press (1981). (CONF-800950—Vols.1,2; EUR—7035).

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

In two volumes.

Beams of fast neutral atoms injected into initially cold target plasmas have aided in the study of the properties of hot confined plasmas approaching reactor-like conditions. Neutral beam injection has been used as a plasma heating tool on the PLT tokamak for about three years now, resulting in a plasma ion temperature of 7 keV, above the minimum reactor ignition requirement, and driving the bulk plasma deep into the collisionless reactor-like regime. Injection heating has been applied to plasmas in the PDX tokamak, starting in March 1980. The parallel conditioning and shakedown procedures of the first two injectors and the tokamak discharges are now yielding initial information.

4146 **Thermal consequences of plasma disruptions in TFTR and ETF.** Budny, R.; Ludescher, C. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 1073-1077 of Fusion technology 1980. Vol. 2. Oxford, England; Pergamon Press (1981). (CONF-800950—Vols.1,2; EUR—7035).

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

In two volumes.

We studied thermal responses of first walls for TFTR and ETF during plasma disruptions. To model the flux, we assumed the entire kinetic energy is deposited by axisymmetric horizontal displacement of the plasma. The deposition time is a free parameter. In TFTR, the minimum deposition time which does not cause the toroidal limiter to melt is 7 or 14 ms depending on whether or not the limiter is actively cooled. In ETF, the minimum time which does not cause surface melting of the cooling tubes is 80 ms.

## 7002 Fusion Power Plant Technology

*REFER ALSO TO CITATION(S) 2060, 2683, 2684, 3076, 3077, 3078, 4044, 4109, 4137, 4138*

4147 **(CEA-N—2338) Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment.** Besnard, D. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Dec 1982. 128p. (In French). NTIS (US Sales Only), PC A07/MF A01. Order Number DE84700013.

We consider classical plasmas, where the background distributions are Maxwellian, in order to couple our study of fast ions transport with existing hydro codes, specially tailored to handle ICF simulations. We first study diffusion type approximations for the Fokker-Planck equation and discuss its ability to reproduce numerical results given by direct integration of the F.P. equation. We show results for transparent plasmas which is the worst possible case. It appears that these approximations give results in qualitatively good agreement with exact results, but that we need a more sophisticated treatment of the boundary conditions. We present particle simulation for solving the hyperbolic part of the F.P.E., coupled by a splitting with the other part of the equation. This remaining parabolic equation is solved with a standard finite differences scheme. This method was developped in order to enhance the utility of classical kinetic ions transport codes, we mean we designed it to be applicable to more demanding situations, such as transport in non homogeneous plasmas, and can be coupled to hydro transport codes. Economy requires that large differences of temperature and spatial gradient lengths can be represented with a minimum of zones and computational complexity. In the same way, it is likely that the algorithm reproduces important limiting cases and preserves gross conservation properties even with coarse zoning or large time steps. Results are very accurate and we have to insist on the fact that it is impossible in certain cases to neglect the velocity diffusion term of the F.P.E.

4148 **(CLM-R—226) Predicted behaviour of the single-null divertor of INTOR.** Harrison, M.F.A.; Hotston, E.S. (UKAEA Culham Lab., Abingdon). Sep 1982. 24p. HMSO, London, price Pound 2.00.

The performance of the single-null divertor is modelled over a range of scrape-off plasma parameters in the INTOR Phase I and Phase IIA. The behaviour of beryllium and tungsten is compared. The models predict that the DT plasma within the divertor chamber is cooled by localised recycling and that most of the energy which flows into the chamber is eventually deposited upon the target by convective transport through the sheath. Catastrophic

sputtering of a tungsten target is possible but unlikely. The temperature of the plasma at the sheath edge and also the effective sputtering of impurity atoms are sensitive to the plasma density in the scrape-off region. Increasing the scrape-off density to about 8 x $10^{19}$ $m^{-3}$ ensures that the effective sputter yield of tungsten does not exceed approximately $10^{-4}$. For a tungsten target the speed of the vacuum pumps needed to maintain 5% of helium within the scrape-off plasma is predicted to be about 150 $m^3$ $s^{-1}$ at 300K. A beryllium target almost doubles the pumping requirements. It is concluded that tungsten should be the recommended target material for the divertor of INTOR. Target lifetime and plasma purity could be enhanced by operating the scrape-off plasma at a density in excess of the specified value, ie $> 5 \times 10^{19}$ $m^{-3}$.

4149 **(CLM-R—230) Ripple transport in INTOR.** Ashby, D.E.T.F.; Hastie, R.J.; Hitchon, W.N.G.; Hughes, M.H. (UKAEA Culham Lab., Abingdon). 1982. 13p. Available from HMSO, London, price Pound 2.00.

The possibility of controlling the power output from INTOR and preventing 'thermal-runaway' by utilising the effect of magnetic field ripple on thermal transport has been investigated with a 1-D transport code; the code uses analytic expressions derived from current theories including the effects of localised particles. The results indicate that any significant control by ripple effects would appear impractical.

4150 **(CLM-R—231) Liquid lithium as a coolant for Tokamak fusion reactors.** Holroyd, R.J.; Mitchell, J.T.D. (UKAEA Culham Lab., Abingdon). 1982. 46p. Available from HMSO, London, price Pound 3.00.

Three-dimensional magnetohydrodynamic flows due to streamwise variations of duct dimensions and shape and magnetic field strength produce pressure gradients larger than those predicted by assuming local fully developed flow. These effects are included in this study of lithium cooling of the blanket of the Culham Conceptual Tokamak Reactor Mark IIA. Principal results are summarised in terms of the pumping power required to circulate the lithium coolant for specific wall loadings for various coolant piping designs and ranges of operating parameters.

4151 **(CLM-R—232) Predicted behaviour of the pumped limiter of INTOR.** Harrison, M.F.A.; Hotston, E.S. (UKAEA Culham Lab., Abingdon). Sep 1982. 24p. HMSO, London, price Pound 2.00.

Modelling of the pumped limiter envisaged for INTOR Phase IIA predicts that an effective exhaust of helium can be attained with a pumping speed of about 100 $m^3$ $s^{-1}$ provided that the power flow to the under-surfaces of a tungsten limiter plate is not less than about 6 MW; compatible with a tip loading of 1 MW $m^{-2}$. Plasma characteristics below the limiter plate are sensitive to the exhaust speed of the vacuum system. Tungsten and beryllium limiter plates are compared. The sputter rate of tungsten is low (typically $< 1$ cm/year); self-sputtering is not likely to be a problem even if the charged particle input power is as high as 40 MW. Sputter erosion of the beryllium plate is large (approximately 20 cm/year) and the helium exhaust pumping requirements for beryllium are about twice as demanding as those for tungsten. Localised recycling of DT ions in the immediate vicinity of the limiter is a significant transport mechanism when the scrape-off plasma density is approximately greater than $10^{19}$ $m^{-3}$. The charged particle power flow necessary to maintain this recycling is at least 4 MW and, there is a substantial temperature gradient between the sheath regions at the limiter plate and the bulk of the scrape-off plasma. The temperature at the separatrix distant from the plate may therefore be in excess of 50 eV.

4152 **(CONF-8210204—1) Performance characterization of pneumatic single pellet injection system.** Schuresko, D.D.; Milora, S.L.; Hogan, J.T.; Foster, C.A.; Combs, S.K. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE84001954.

From American Vacuum Society meeting; Baltimore, MD, USA (16 Oct 1982).

The Oak Ridge National Laboratory single-shot pellet injector, which has been used in plasma fueling experiments on ISX and PDX, has been upgraded and extensively instrumented in order to study the gas dynamics of pneumatic pellet injection. An improved pellet transport line was developed which utilizes a 0.3-cm-diam by 100-cm-long guide tube. Pellet gun performance was characterized by measurements of breech and muzzle dynamic pressures and by pellet velocity and mass determinations. Velocities up to 1.4 km/s were achieved for intact hydrogen pellets using hydrogen propellant at 5-MPa breech pressure. These data have been compared with new pellet acceleration calculations which include the effects of propellant friction, heat transfer, time-dependent boundary conditions, and finite gun geometry. These results provide a basis for the extrapolation of present-day pneumatic injection system performance to velocities in excess of 2 km/s.

4153 **(DOE/ER/52061—1) Fusion reactors: physics and technology. Annual progress report.** Conn, R.W. (California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering). Aug 1983. Contract AT03-80ER52061. 109p. NTIS, PC A06/MF A01. Order Number DE83017148.

Portions are illegible in microfiche products.

Fusion reactors are designed to operate at full power and generally at steady state. Yet experience shows the load variations, licensing constraints, and frequent sub-system failures often require a plant to operate at fractions of rated power. The aim of this study has been to assess the technology problems and design implications of startup and fractional power operation on fusion reactors. The focus of attention has been tandem mirror reactors (TMR) and we have concentrated on the plasma and blanket engineering for startup and fractional power operation. In this report, we first discuss overall problems of startup, shutdown and staged power operation and their influence on TMR design. We then present a detailed discussion of the plasma physics associated with TMR startup and various means of achieving staged power operation. We then turn to the issue of instrumentation and safety controls for fusion reactors. Finally we discuss the limits on transient power variations during startup and shutdown of $Li_{17}Pb_{83}$ cooled blankets.

4154 **(DOE/ER/53111—2) Alternate fusion-fuel-cycle plasma physics and reaction kinetics. Final report.** Conn, R.W. (California Univ., Los Angeles (USA)). 1981. Contract AT03-81ER53111. 3p. NTIS, PC A02/MF A01. Order Number DE83016802.

The bulk of the research is focused on the development and the application of the fusion reaction kinetic theory, and a continuing study of significant physics phenomena which impact current understanding of plasma reactivity, the energy balance, and the n tau requirement or predicted Q value of fusion fuel cycles.

4155 **(DOE/ET/52017—T1) Methods of economic analysis applied to fusion research. Final report.** (ECON, Inc., Princeton, NJ (USA)). 28 Feb 1983. Contract AC02-77ET52017. 105p. NTIS, PC A06/MF A01. Order Number DE84002366.

In this and previous efforts ECON has provided economic assessment of a fusion research program. This phase of study focused on two tasks, the first concerned with the economics of fusion in an economy that relies heavily upon synthetic fuels, and the second concerned with the overall economic effects of pursuing soft energy technologies instead of hard technologies. This report is organized in two parts, the first entitled An Economic Analysis of Coproduction of Fusion-Electric Energy and Other Products, and the second entitled Arguments Associated with the Choice of Potential Energy Futures.

4156 **(DOE/ET/53088—102) Sustained self-reversal in the reversed field pinch.** Aydemir, A.Y.; Barnes, D.C. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Aug 1983. Contract FG05-80ET53088. 16p. NTIS, PC A02/MF A01. Order Number DE84001559.

Spontaneous reversal of the toroidal field in a Reversed Field Pinch as a result of low-$\beta$ kink-tearing mode activity is investigated using a 3D incompressible MHD code. Helical and 3D steady reversed states are obtained. In 3D a critical value of the

pinch parameter is observed above which only quasi-steady fluctuating states are seen.

4157 **(DOE/ET/53088—107) Elimination of stochasticity in stellarators.** Hanson, J.D.; Cary, J.R. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1983. Contract FG05-80ET53088. 14p. NTIS, PC A02/MF A01. Order Number DE84001560.

A method for optimizing stellarator vacuum magnetic fields is introduced. Application of this method shows that the stochasticity of vacuum magnetic fields can be made negligible by proper choice of the coil configuration. This optimization is shown to increase the equilibrium $\beta$-limit by factors of two or more over that of the simple, straight coil winding law. This method is general and ought to be applicable to other systems in which stochasticity: (1) is a problem, yet (2) is affected by the design parameters.

4158 **(EGG-FT—6392) Final report on PE-II activities from August 1981-September 1983.** Deis, G.A.; Bohn, T.S.; Hsu, P.Y.; Liebenthal, J.L.; Longhurst, G.R.; Miller, L.G.; Schmunk, R.E.; Uldrich, E.D.; Wadkins, R.P.; Ware, A.G. (EG and G Idaho, Inc., Idaho Falls (USA)). Oct 1983. Contract AC07-76ID01570. 189p. NTIS, PC A09/MF A01. Order Number DE84002521.

This report documents all of the technical work performed by EG and G Idaho, Inc., from August 1981 through 1983 on Program Element-II (Blanket/Shield Thermal-Hydraulic/Thermomechanical Technology) of the Department of Energy (DOE) Office of Fusion Energy's First Wall/Blanket/Shield Engineering Technology Program. Following Section 1 which is a summary of the overall program, six major activities are described in separate sections. Section 2 is an evaluation of methods for simulation fusion bulk heating for thermal-hydraulic/thermomechanical testing. Section 3 is a survey of facilities which might be suitable for such testing. Section 4 describes the development of a strategy for resolving the identified thermal-hydraulic/thermomechanical data needs through a combination of nuclear and nonnuclear testing. Section 5 is a detailed plan for work in Phase I of Program Element-II. Sections 6 and 7 describe two activities undertaken by EG and G: the design of the nonnuclear solid-breeder concept integral simulation test, and the planning for a nuclear test which could follow it. Following these activities, EG and G participation in Program Element-II was terminated; thus, this report serves as the final report on technical work for Program Element-II at Eg and G.

4159 **(GAO/RCED—83-105) Status of DOE's implementation of the Magnetic Fusion Energy Engineering Act of 1980.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). 29 Apr 1983. 37p. General Accounting Office, Document Handling and Information Service Facility, P.O. Box 6015, Gaithersburg, MD 20760.

The Magnetic Fusion Energy Engineering Act of 1980 authorized an accelerated and ambitious research and development program directed toward the commercial demonstration of nuclear fusion - a potentially inexhaustible source of energy - by the end of the century. Although progress has been made, funding for the program has not been sustained at the levels envisioned in the act. Consequently, DOE has adjusted its fusion research program and revised its fusion development strategy to fit available and projected funding levels. GAO believes that DOE needs to explain and justify its revised fusion development strategy to the Congress. The appropriate place is the act's required comprehensive program management plan to be submitted to relevant congressional committees. According to DOE, budget uncertainties initially delayed preparation of the plan and its final issuance is now being held up by extensive reviews both internally and by the Executive Office of the President.

4160 **(HEDL-SA—2987) FMIT: an accelerator-based neutron factory for fusion materials qualification.** Burke, R.J.; Hagan, J.W.; Trego, A.L. (Hanford Engineering Development Lab., Richland, WA (USA)). 1983. Contract AC06-76FF02170. 7p. (CONF-830920—10). NTIS, PC A02/MF A01. Order Number DE84001464.

From 7. symposium on sources and ion assisted technology and 4. international conference on ion and plasma assisted techniques; Kyoto, Japan (12 Sep 1983).

The Fusion Materials Irradiation Test Facility will provide a unique testing environment for irradiation of structural and special-purpose materials in support of fusion-power systems. The neutron source will be produced by a deuteron-lithium stripping reaction to generate high-energy neutrons to ensure materials damage characteristic of the deuterium-tritium power system. The facility, its testing role, the status, and major aspects of its design and supporting system development are described. Emphasis is given to programmatic elements and features incorporated in the accelerator and other systems to assure that the FMIT runs as a highly reliable fusion materials testing installation.

4161 **(IA—1378) Laser-driven shock wave studies in single and double-layered slab targets.** Eliezer, S.; Gitter, L.; Krumbein, A.D.; Salzmann, D. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). Jan 1983. 46p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700017.

Simulations of laser-driven shock waves were carried out by means of a 1-D Lagrangian hydrodynamic code for polyethylene and aluminium slab targets. It was found that the shock front is accelerated into the cold material till t is approximately 0.8 tau (tau is the laser pulse width) and only later is a constant velocity propagation attained. Scaling laws were obtained for the pressure and temperature of the compression wave, which are in good agreement with those published in other works. Calculations of pressure, compression and shock wave motion were also carried out for laser-driven slab targets composed of $CH_2$ on aluminium and aluminium on $CH_2$ in the intensity range of $10^{13}$ to $10^{14}$ W/cm$^2$. High compressions were found to occur at the interface of $CH_2$ on Al targets due to impedance mismatch but were not found when the layers were reversed. The persistence time of the high pressure on the interface in the $CH_2$ on A1 case is long relative to the characteristic times of the plasma. It was also found that the pressure and compression on the interface can be optimized by adjusting the $CH_2$ layer thickness.

4162 **(IAE—3525/8) Calculation of temperature fields in the pulsed fusion reactor blanket elements.** Lipov, M.Yu.; Murav'ev, E.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 25p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703991.

The formation of temperature fields in pulsed fusion reactor blanket elements is considered. The problem is set on a temperature field in an unlimited flat wall at instantaneous volumetric heating and boundary conditions of a third kind with the constant physical properties of the wall and coolant materials. An analytical solution of the problem is given. The basic regularities in the temperature field formation in a flat wall are shown, in particular the existence of a steady temperature field whose characteristics have been determined by two ways. The time is determined of the steady operation attainment, and calculation is performed of the temperature and temperature drop in the wall material at the initial period of the facility operation. The steady temperature field has been studied in detail. The results are presented in the form of dimensionless relationships for a wide range of operating parameters. The model elaborated may be used for the estimation calculations when selecting the balnket parameters or other assemblies of pulsed fusion reactor design members and conditions for their cooling.

4163 **(IAE—3545/7) Evolution of spontaneous magnetic fields in an expanding laser-produced plasma.** Bol'shov, L.A.; Dykhne, A.M.; Kiselev, V.P.; Favorskij, A.P.; Yudin, A.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1982. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE84700018.

The generation process of spontaneous magnetic fields in an expanding laser-produced plasma is studied. It is shown that the initial stage of magnetic fields evolution in plasma heated with laser radiation is correctly reflected in the magnetic-thermal statement of

the problem. The saturation of the magnetic field generation has a threshold with respect to the sharpness of the heat contribution spatial distribution. The allowance for the plasma movement restricts the maximum of the magnetic field; its effect on the integral characteristics, such as the total flow through the calculated region, is considerably smaller. The main cause of the stabilization of the magnetic field magnitude is the correlation of electron density and temperature profiles. The magnetic fields generation affects significantly the heat transfer processes, and leads to electron overheat. A contrary effect of the magnetic field on the generation process, leading to the increase in the magnetic field flow, takes place. The allowance for the ionization processes during laser heating shows that the main characteristics of magnetic fields in this case slightly differ from the stripped plasma case.

4164 (IAEA-TECDOC—277, pp 11-13) **Past IAEA activities in the area of fusion safety. A brief overview.** Flakus, F.N. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

Published in summary form only.

4165 (IAEA-TECDOC—277, pp 15-44) **Tritium handling requirements and development for fusion.** Anderson, J.L. (Los Alamos National Lab., NM (USA)). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

Tritium technology development for the Department of Energy fusion program is taking place principally at three laboratories; Mound Facility, Argonne National Laboratory, and Los Alamos National Laboratory. This paper reviews major aspects of these three programs and discusses aspects of the tritium technology development at other laboratories in the U.S. Facilities and experiments discussed include the Tritium Effluent Control Laboratory and the Tritium Storage and Delivery System for the Tokamak Fusion Test Reactor at Mound Facility, the Lithium Processing Test Loop and the solid breeder blanket studies at Argonne, and the Tritium Systems Test Assembly at Los Alamos. Work at the Lawrence Livermore National Laboratory and the Oak Ridge National Laboratory will also be discussed.

4166 (IAEA-TECDOC—277, pp 49-62) **Summary of HEDL Fusion Reactor Safety Support studies.** Muhlestein, L.D.; Jeppson, D.W.; Barreca, J.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

The HEDL Fusion Reactor Safety Support studies are focused on characterizing blanket-coolant-material reactions for deuterium-tritium fusion reactor designs. The objective is to determine and examine potential safety and environmental issues associated with proposed blanket/coolant combinations under postulated accident conditions. The first studies considered liquid lithium as both blanket and coolant, and examined liquid lithium-material reactions. Liquid lithium reactions with oxygen, nitrogen, and various concretes have been characterized. Evaluations of lithium reaction extinguishment methods, lithium aerosol generation and collection, and the volatilization and transport of radioactive materials in connection with lithium-air reactions have been completed. Lithium compound blanket material reactions with water, a prime coolant candidate, have been characterized in terms of energy and gas release rates. Blanket materials considered were lithium aluminate, lithium oxide, lithium zirconate, lithium silicate, and lithium lead alloys ($Li_7Pb_2$ and $Li_{17}Pb_{83}$).

4167 (IAEA-TECDOC—277, pp 65-77) **Safety methodology and risk targets.** Kazimi, M.S. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

In assessing the potential safety concerns of fusion, the experience from other energy sources lead to a variety of safety assessment approaches. The available approaches are: (1) The maximum possible accident approach; (2) The maximum credible accident approach; (3) The probabilistic total risk assessment. In the first approach, the mechanistic development of the events leading to the safety concern is ignored. Instead, the total radioactivity of the plant is assumed accessible to the public. Such an approach is obviously conservative and unrealistic. In the second approach a selection is made among the most severe of the possible accidents, and the progression of the accident is modeled as mechanistically as possible. In this case, the passive and active accident mitigation capabilities of the plant are taken into consideration. The result is expected to be that none or only a fraction of the total radioactivity can be released to the public. The adverse effect of this approach is to concentrate attention on a particular accident class, and perhaps not allow for other classes, a judgement that may later become undesirable. The probabilistic risk assessment requires the safety analysts to consider all classes of accidents and estimate both the probabilities of their occurrences and their consequences. Thus, the plant design in fact is subjected to a thorough investigation and the impact of alterations in design can be reflected in the total risk estimate. The disadvantage of this approach lies in the absence of well defined acceptable risk criteria as well as the large effect of public perception factors on the accepted risk. This paper will review the impact of application of these approaches in determination of the level of protection needed against activation product release to the atmosphere.

4168 (IAEA-TECDOC—277, pp 93-105) **Superconducting magnet safety.** Arendt, F.; Komarek, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Technische Physik). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

One of the major components in a fusion reactor for which a safety analysis must be carried out is the magnet system. Most of the possible disturbances influencing the operation of superconducting magnets lead only to a quench, defined as an "abnormal operating condition" which causes just a temporary shut down of the magnet system without damage, if the system is well designed. More unlikely are accidental events which are associated with the generation of high power arcs. In these cases, single current arcs, e.g. at broken current leads, will lead to moderate damage only, but with the necessity of a longer shut down period for repair or replacing. Severe damage can only occur if in a multiple current arcing, starting by broken conductors, a wide-spread rupture of the winding occurs and the final high power arc burns through the coil case damaging other coils and reactor components. In a very hypothetical event the simultaneous rupture of the complete winding at two locations at least 1 m apart leads to missile generation due to the electromagnetic forces in the background field. The kinetic energy which the flying piece can get will be less than the values assumed for airplane crashes with the containment of modern fission power plants.

4169 (IAEA-TECDOC—277, pp 155-159) **Fusion safety and protection issues: Lessons from fast breeder reactors and reprocessing plant studies.** Rouyer, J.L. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). Mar 1983. NTIS (US Sales Only), PC A09/MF A01. (CONF-810352—).

From International Atomic Energy Agency conference on fusion safety; Vienna, Austria (23 Mar 1981).

The experience gained in the design and operation of nuclear reactors and fuel cycle facilities should be used to: develop a safety analysis which helps the designers and provides workers and public protection; provide means to respond to tritium problems; study the non-radioactive risks. This effort should give a high priority to technical evolution and innovations.

4170 **(IPPJ—553) Bremsstrahlung energy loss of degenerate plasma.** Yamaguchi, Seiya; Kawata, Shigeo; Abe, Takashi; Niu, Keishiro. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Mar 1982. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700022.

The integrated emission coefficient for bremsstrahlung is derived for the plasma with an arbitrary electron degeneracy. This coefficient is shown to have two plausible limiting values of classical and fully degenerate cases. It is pointed out that the effect of electron degeneracy reduces the bremsstrahlung energy loss to $10^{-2}$ times of that in the nondegenerate case in the typical state of an ICF target whose number density is $4.5 \times 10^{26}/cm^3$ and temperature is $10^6$K.

4171 (JAERI-M—9775, pp 19-24) **Trapping and re-emission of energetic hydrogen and helium ions in materials.** Yamaguchi, Sadae (Tohoku Univ., Sendai (Japan). Faculty of Engineering). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The experimental results on the trapping and re-emission of energetic hydrogen and helium ions in materials are explained. The trapping of deuterium and helium in graphite saturates at the concentration of $10^{18}$ ions/cm$^2$. The trapping rate of hydrogen depends on the kinds of target materials. In the case of the implantation in Mo over $3 \times 10^{16}$ H/cm$^2$, hydrogen is hardly trapped. On the other hand, the trapping of hydrogen in Ti, Zr and Ta which form solid solution is easily made. The hydrogen in these metals can diffuse toward the inside of metals. The deuterium retained in 316 SS decreased with time. The trapping rate reached saturation more rapidly at higher implantation temperature. The effective diffusion constant for the explanation of the re-emission process is 1/100 as small as the ordinary value. The radiation damage due to helium irradiation affects on the trapping of deuterium in Mo. The temperature dependence of the trapping rate can be explained by the diffusion model based on the Sievert's law. The re-emission of helium was measured at various temperature. At low temperature, the re-emission was low at first, then the rate increased. At high temperature, the re-emission rate was high from the beginning.

4172 (JAERI-M—9775, pp 25-31) **Trapping-detrapping phenomena of hydrogen, helium and their isotopes into or from materials.** Kudo, Hiroshi (Tsukuba Univ., Sakura, Ibaraki (Japan)). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The experimental results on the trapping-detrapping phenomena of hydrogen, helium and their isotopes are reviewed. The depth distribution and the amount of trapping of H or He implanted into solids have been measured by ion backscattering and nuclear reaction methods. The measurements showed the blistering included in the trapping phenomena. The depth distribution of deuterium implanted into Zr showed a peak near the surface at 250 degree K. This peak may be the trapping by the field of stress due to the radiation damage of Zr or implanted deuterium. The trapping occurred in the form of precipitation in hydride-forming materials such as Zr. The trapping of deuterium in Zr was found at the position of radiation damage. The trapping of deuterium in the complex of Y and a hole made in iron was reported.

4173 (JAERI-M—9775, pp 32-46) **Reflection of low-energy light-element ions from solid surfaces.** Gesi, Kazuo (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1981. NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

Brief description of the reflection process of low-energy light-element ions from solid surfaces is presented in this paper. The definitions of parameters which describe the process are given. The species and energy of incident particles, the direction of incidence, the species, surface state, temperature and pre-treatment of targets, and the index of the surface plane are the important parameters to describe the phenomena. The informations about reflected particles were obtained through the scattering function. Energy distribution, spatial distribution, the fraction of the charged states, total particle reflectivity, mean reflected energy, and total energy reflectivity are the items of discussion. The total particle reflectivity as a function of reduced incident energy has been given for various combination of incident particle species and target materials. A universal relation was seen between the reflectivity and the reduced energy, and it can be represented by an empirical formula. A peak was observed in the energy distribution profiles of the reflected helium atoms from Ni surface. This peak, called surface peak, was caused by a single elastic collision of incident particles against surface atoms. The fractional intensity of the various charged states of reflected particles was measured when Au was bombarded with $H_2$ ions. The spatial distribution of the particle reflection has been measured. The computer simulation was also made, and good agreement with the observed results was seen.

4174 (JAERI-M—9775, pp 47-52) **Empirical formulas for the reflection of light ions from solids.** Tabata, Tatsuo (Radiation Center of Osaka Prefecture, Sakai (Japan)). Nov 1981. NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

A study on the formulation of an empirical equation related to the reflection of light ions from solids is described. The parameters considered were the number reflection coefficient, the energy reflection coefficient and the relative mean energy. The targets were classified into two groups, since there is deviation from the scaling law. The materials with the stopping power near the minima of $Z_2$-oscillation have been classified into group 1, and those with the stopping power near the maxima into group 2. The constants in the proposed empirical formula were determined through the least-squares fit to the available experimental data, and the representative sets of Monte Carlo data at lower energy. The formula was compared with the data points and satisfactory agreement was seen.

4175 (JAERI-M—9775, pp 53-58) **Reflection of low energy light-element ions from solid surfaces.** Morita, Kenji (Nagoya Univ. (Japan). Faculty of Engineering). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The reflection of low energy light-element ions from solid surfaces has been studied. The parameters to be considered are particle reflectivity and energy reflectivity. These are important for the estimation of the reflection of light ions from the first walls of fusion reactors. The formulas for these parameters as the functions of reduced energy have been presented. Since the reflected particles in the considered energy range are mostly neutral particles, the experimental apparatuses for the observation are large scale devices, and the measurement is time-consuming and troublesome. The development of various experimental methods has been done. The experimental results showed that the particle reflectivity decreased monotonously with the increase of reduced energy, and the energy reflectivity showed the same pattern. The transport theory, the single collision model and the computer simulation were applied for the explanation of the phenomena.

4176 (JAERI-M—9775, pp 59-71) **Desorption by ions and electrons.** Nagai, Shiro (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

Review of the studies on ion-impacted desorption (IID) and electron-stimulated desorption (ESD) is presented. The mechanism of ESD can be explained by a same model proposed by Menzel and Gomer as well as Redhead. The model is based on the one-dimensional classical theory, and is similar to an excitation model for gas phase molecules. Most of the experimental results are explained by the model except the desorption of oxygen atoms from metal surfaces. The desorbing species are mostly the neutral molecules at the

ground states. The energy distribution of desorbing ions has been measured. The desorption cross sections (Q) were measured. The Q for neutral molecules is about $10^{-18}$ cm², and that for positive ions is $10^{-22}$ cm², when the impact energy of electrons is about 100 eV. The data of IID are scarce. Since the cross sections reported are larger than those of ESD, the IID may be important for the study on the plasma-wall interaction. The IID can be explained by a two-body collision model based on the sputtering model by Sigmund. The IID cross sections are inversely proportional to the adsorption heat. The cross sections reported are in the range from $10^{-14}$ to $10^{-17}$ cm².

4177 (JAERI-M—9775, pp 89-94) **Stopping power and effective charge of low-velocity ions in metals.** Kitagawa, Mitsuo (North Shore College, Atsugi, Kanagawa (Japan)); Brandt, W. Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The stopping power and effective charge of low-velocity ions in metals were analyzed. The electron excitation part in the energy loss process of charged particles passing through materials can be divided into close collision and distant collision. The minimum collision coefficient of the close collision (individual collision) is smaller than the ion radius, and the effective charge is larger than the amount of charge of ions. This effect increases with the small atomic number of ions and in the low energy region. The stopping power was defined and calculated, and the effective charge ratio was also obtained. The deviation of the effective charge from a universal curve is explained. The velocity dependence of ion charge was analyzed. A curve obtained from a numerical analysis by the Brandt's velocity condition shows a good agreement with the experimental results.

4178 (JAERI-M—9775, pp 95-99) **Identification and lattice location of low-Z impurities implanted into solids.** Komaki, Ken-ichiro (Tokyo Univ. (Japan). Coll. of General Education). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The methods of the identification and lattice location of low-Z impurities implanted into solids are described. The detection of impurities which have larger mass number than that of matrix materials is made by the Rutherford back-scattering (RBS) of heavy ions. The detection of light elements can be made by nuclear reaction methods. The depth distribution of impurities is obtained from the measurement of the energy loss of incident and emitted particles. The channeling effect of incident particles and the blocking effect of emitted particles are used for the determination of the lattice location of impurites. The behavior of hydrogen isotopes is an important problem for the first wall technology of fusion reactors, but the reports on this problem are hardly seen at present.

4179 (JAERI-M—9775, pp 101-117) **Ion irradiation damage of metals.** Kiritani, Michio; Sasaki, Shigemi (Osaka Univ., Toyonaka (Japan). Faculty of Engineering Science). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

A study on the ion irradiation damage of metals and a review of the studies on the cross-sections of ion irradiation damage are described. The experimental study has been performed with Van de Graaff type accelerators of Japan Atomic Energy Research Institute (JAERI). The irradiated samples were observed with an electron microscope. High temperature argon ions were irradiated on high purity Ni, and the structure of damage was observed. The light ion irradiations on Ni and Mo were also performed. The void formation in Ni irradiated by Ar was due to Ar atoms. It was found that large voids near the surface contracted to medium size voids, but voids at deep positions were hard to contract. The depth distribution of defects in Ni and Mo irradiated with light ions at room temperature deviated largely from the estimation of the projected range of ions. The investigation of the studies on the cross-sections of ion irradiation damage was made and is reported. The problems studied at various laboratories were the irradiation by self-ions, the segregation under irradiation, the depth distribution of damage and helium implantation effects.

4180 (JAERI-M—9775, pp 118-124) **Defect production rates in ion-irradiated metals.** Iwata, Tadao (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

The defect production rate in metals irradiated with fast ions at low temperature was investigated. The detection of defects was made by measuring electric resistivity. The average number of primary knock-on atoms (PKA) is obtained as a function of displacement threshold energy. At the Argonne National Laboratory, the defect production rate in Cu and Ag was obtained from the measurement of electric resistivity. The damage efficiency, which is the ratio of the experimental values and the theoretical values of damage cross-sections, was obtained. The damage efficiency decreased from 1 to 0.3 when the energy of the PKA increased. At ORNL, the depth distribution of defects was measured. The self-ion implantation to Al and Ni and the Ni-ion irradiation on Fe-Cr alloy were made, and the distribution of defects was obtained. The results were compared with the theoretical results. The experiments on other metals are also described.

4181 (JAERI-M—9775, pp 125-129) **Blistering due to neutral He particle bombardment in refractory metals.** Nunogaki, Masanobu; Okada, Touichi (Osaka Univ., Suita (Japan). Faculty of Engineering). Nov 1981. (In Japanese). NTIS (US Sales Only), PC A08/MF A01. (CONF-810189—).

From Workshop on the particle material interaction for fusion research; Tokyo, Japan (12 Jan 1981).

A method to obtain neutral particle beam which has widely distributed energy spectra is developed. Neutral He beam was produced by this method, and a Mo plate was irradiated at 300 degree K. The blistering was formed and observed. It was found that the blistering was formed by the neutral beam with continuously changing energy, the area distribution of blister surfaces spread widely, and the various shapes of blistering were observed. These results were due to the effect of beam energy dispersion. The reports on blistering published mainly in 1980 are introduced in this paper.

4182 (KAERI/RR—381/82) **Survey of fusion reactor technology. Development of design technology for the magnet system of Tokamak fusion reactor.** Chung, M.K.; Kang, H.D.; Oh, Y.K.; Lee, K.W.; In, S.Y.; Kim, Y.C. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1983. 116p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE84700034.

The present object of the fusion research is to accomplish the scientific break even by the year of 1986. In view of current progress in the field of Fusion reactor development, we decided to carry out the conceptual design of Tokamak-type fusion reactor during the year of 82-86 in order to acquire the principles of the fusion devices, find the engineering problems and establish the basic capabilities to develop the key techniques with originality. In this year the methods for calculating the locations of the poloidal coils and distribution of the magnetic field, which is one of the most essential and complicated task in the fusion reactor design works, were established. Study on the optimization of the design method of toroidal field coil was also done. Through this work, we established the logic for the design of the toroidal field coil in tokamak and utilize this technique to the design of small compact tokamak. Apart from the development work as to the design technology of tokamak, accelerating column and high voltage power supply (200 KVDC, 100 mA) for intense D-T neutron generator were constructed and now beam transport systems are under construction. This device will be used to develop the materials and the components for the tokamak fusion reactor.

4183 (KEK—79-17, pp 155-168) **Enhancement of energy deposition of intense electron beam on low Z targets.** Nakai, S.; Imasaki, K.; Miyamoto, S.; Higaki, S.; Nishihara, K. (Osaka Univ. (Japan)). Aug 1979. NTIS (US Sales Only), PC A06/MF A01. (CONF-7903159—).

From 2. KEK symposium on radiation dosimetry; Oho, Ibaraki, Japan (22 Mar 1979).

The interaction between intense electron beam and solid target has been investigated. A strongly enhanced deposition of tightly focused REB on low Z solid target is experimentally observed. The results are explained by the dissipation model due to kinetic two stream instability in corona plasma.

4184 (LA—9737-MS) **Modular stellarator reactor: a fusion power plant.** Miller, R.L.; Bathke, C.G.; Krakowski, R.A.; Heck, F.M.; Green, L.; Karbowski, J.S.; Murphy, J.H.; Tupper, R.B.; DeLuca, R.A.; Moazed, A. (Los Alamos National Lab., NM (USA)). Jul 1983. Contract W-7405-ENG-36. 323p. NTIS, PC A14/MF A01. Order Number DE84002268.

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A comparative analysis of the modular stellarator and the torsatron concepts is made based upon a steady-state ignited, DT-fueled, reactor embodiment of each concept for use as a central electric-power station. Parametric tradeoff calculations lead to the selection of four design points for an ~ 4-GWt plant based upon Alcator transport scaling in l = 2 systems of moderate aspect ratio. The four design points represent high-aspect ratio. The four design points represent high-(0.08) and low-(0.04) beta versions of the modular stellarator and torsatron concepts. The physics basis of each design point is described together with supporting engineering and economic analyses. The primary intent of this study is the elucidation of key physics and engineering tradeoffs, constraints, and uncertainties with respect to the ultimate power reactor embodiment.

4185 (NIIEFA-P-B—0558) **Normal phase detection in the "Tokamak-15" toroidal coil.** Dubasov, V.G.; Zhelamskij, M.V. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1982. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700036.

Requirements for a normal phase (NP) detection device used to protect the toroidal field superconducting coil (TFSC) in the "Tokamak-15" are given. Principles of device construction are described, block diagrams are presented. The device is based on the detection of active voltage that appears at the TFSC when its sections transit to the normal state. The coil protection device has two functions: 1) high-sensitive detection of a transition for the current control in order to recover superconductivity by changing the TFSC current; 2) protective energy removal from the TFSC when the current change does not cause disappearance of the normal phase and it achieves the permitted level (protective level). The device detects NP-signal in the protective output regime at the level of 100-500 mV, in current control regime at 2-50 mV under the noise level +-0.5 V. The detection time may be chosen in the range of 0.01-0.5 s depending on the noise duration. Insulation of the galvanic decoupling units takes the voltage of 3 kV. High reliability of the system is ensured by reserve channel and emergency protection channel that control the state of the basic units.

4186 (NIIEFA-P-B—0573) **Numerical simulation of the operation regimes of the poloidal field system of a tokamak reactor.** Filatov, O.G. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1982. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703996.

Numerical simulation of the operation regimes of the poloidal field system of a tokamak reactor without magnetic core at designed discharge evolution is considered. The technique of the problem solution realized in POLO computerized program is described. As an example, results of numerical calculation of operation of the INTOR tokamak reactor with poloidal limiters and without a divertor are presented.

4187 (NIIEFA-P-G—0555) **Study on the poloidal magnetic fields in the "Tuman-3" device.** Belyakov, V.A.; Vasil'ev, V.I.; Kolchin, A.G. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1982. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703997.

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Results of the study on the poloidal magnetic fields using the "Tuman-3" device are presented. The magnetic circuit core located near plasma area (the aspect relation of the device R/a is 2.3) considerably affects the conditions maintaining plasma filament equilibrium. The data from the experimental study are compared to the calculated data obtained when solving the magnetostatic problem in axial symmetry approximation. The calculated data are in agreement with the experimental ones to an accuracy of approximately 5% for the given model of the magnetic circuit. With the coil configuration of the poloidal field chosen the stability of plasma filament equilibrium on a large raduis is maintained, the instability along the vertical being weak. The shape of plasma filament section is close to circular. The poloidal magnetic field characteristics in the chosen mode of operation of the device weakly depend on the magnet core saturation coefficient. In developing the control system of plasma filament position the results of measurements have been used.

4188 (NIIEFA-P-OM—0542) **Calculation of the mechanical strength of the T-15 tokamak discharge chamber.** Gusev, S.V.; Odintsov, V.N.; Rogov, E.A.; Samojlenko, V.D.; Semenov, O.V.; Spirchenko, Yu.V.; Chvartatskij, R.V. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1981. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84700038.

Results of investigation of stress-strained state of the T-15 tokamak discharge chamber under the effect of atmosphere pressure, temperature and magnetic forces are presented. Results of experiments on serviceability of bellows of vertical and horizontal pipes are given. Low cycle fatigue strength of chamber elements is defined. When evaluating the chamber element service life in the vacuum training regime (at atmospheric pressure and temperature of 400 deg C), the least allowed number of repeated loading $N=4x10^3$ is obtained, that essentially exceeds practically realizable number of emergency loadings. Evaluation of chamber aeroice life in operational regime (under the effect of magnetic forces) showed that allowed load cycle number is $N=1.2x10^5$.

4189 (NIIEFA-P-OM—0550) **To the calculation of stress-strained state of the discharge chambers of tokamak devices.** Zhilin, P.A.; Konyushevskaya, R.I.; Pal'mov, V.A.; Chvartatskij, R.V. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1982. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703998.

A numerical computation algorithm of stress-strained state of rotational shells at axially symmetric loads is presented. A boundary problem is brought to a number of Cauchy problems. When constructing initial problems the Runge-Kutta method is used alongside with the Godunov method of descrete orthogonalization. Concrete calculation is carried out for the discharge chamber of thermonuclear device that has cylindrical, conical and toroidal parts. Comparative evaluation of stress-strained state of smooth and meridional ribbed chambers is carried out.

4190 (NRL-MR—5161) **Observation of magnetic fields in laser-produced plasma using the Zeeman effect.** McLean, E.A.; Stamper, J.A.; Manka, C.K.; Griem, H.R.; Droemer, D.W.; Ripin, B.H. (Naval Research Lab., Washington, DC (USA)). 30 Sep 1983. Contract AI08-79DP40092. 30p. NTIS, PC A03/MF A01. Order Number DE84002742.

The self-generated magnetic field produced when a pulsed Nd:glass laser is focused onto a carbon foil target is measured for the first time using the Zeeman effect. Emission from the CV $1s2s^3S/sub\ 1^-/\ 1s2p^3P_2$ (2270.9A) was used for the measurement. At a laser irradiance of ~ 5 x $10^{13}$ W/cm$^2$, the magnetic field increased from 100 kG to 200 kG when the focal spot was changed

from a flat-topped distribution to a ring pattern, which caused higher density gradients. A Faraday rotation measurement at ~ 200 kG agreed with the Zeeman effect measurement. Opacity effects in the plasma enhanced the sensitivity of the Zeeman measurement.

4191 **(NRL-MR—5186) Variation of laser absorption with plasma scalelength in long-scalelength plasmas.** Herbst, M.J.; Grun, J.; Gardner, J.; Stamper, J.A.; Young, F.C.; Obenschain, S.P.; McLean, E.A.; Ripin, B.H. (Naval Research Lab., Washington, DC (USA)). 30 Sep 1983. Contract AI08-79DP40092. 12p. NTIS, PC A02/MF A01. Order Number DE84002743.

A short-pulse, high-intensity Nd-laser beam interacts with performed plasmas of variable scalelength. At the longest scalelength, absorption is limited by backscatter, despite increased collisional absorption.

4192 **(ORNL/TM—8826) Modification for correcting a vacuum design fault in the Veeco Model MS 170 Leak Detector.** Langley, R.A. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE84002249.

A vacuum design fault in the Veeco Model MS 170 Leak Detector is described and a simple and inexpensive solution to correct the fault is provided.

4193 **(TRITA-PFU—80-10) External magnetic field configurations for EXTRAP.** Bonnevier, B. (Royal Inst. of Tech., Stockholm (Sweden). Plasma Physics and Fusion Research). Aug 1982. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704001.

The strongly inhomogeneous magnetic field for stabilization of a pinch in an Extrap configuration can be created in various ways. Some possibilities both for the linear case and for the toroidal case are discussed.

4194 **(UCID—19903) Granular flow considerations in the design of a cascade solid breeder reaction chamber.** Walton, O.R. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE84002474.

Both horizontally and vertically oriented rotating chambers with granular material held on the inner surface by centrifugal action are examined. Modifications to the condition for controlled quasi-static flow on an incline plane, phi/sub w/ $< \alpha <$ phi/sub r/, where phi/sub w/ is the wall friction angle, $\alpha$ is the angle of inclination of the plane, and phi/sub r/ is the drained angle of repose of the material are examined for the case of horizontal and vertical surfaces of revolution. Allowed included half angles for horizontally oriented chambers are likely to be in the range of $30^{\circ} +- 10^{\circ}$ for ceramic particles and metal surfaces. For vertical orientations the maximum half-angle of the top cone is slightly less than the wall friction angle phi/sub w/ while the lower portion can have a half angle as large as ($90^{\circ}$ - phi/sub w). Percolation of fines through shearing granular solids is briefly discussed and recommended experimental and calculational studies to obtain a better understanding of this behavior are described.

4195 **(UCRL—88669) Design and construction of large capacitor banks.** Whitham, K.; Gritton, D.G.; Holloway, R.W.; Merritt, B.T. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 9p. (CONF-830621—47). NTIS, PC A02/MF A01. Order Number DE84002790.

From IEEE power electronics specialists conference; Albuquerque, NM, USA (6 Jun 1983).

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Over the past 12 years, the Laser Program at LLNL has actively pursued laser fusion, using a series of large, solid-state lasers to develop target data leading to reactor designs using the concept of inertial confinement fusion. These lasers are all linear chains of flashlamp driven, Nd-doped glass amplifiers with a master oscillator at the front end. Techniques have been developed during this time to scale the lasers to an arbitrarily large size. A table shows the series of lasers and their parameters that have been developed to date.

4196 **(UCRL—88690) Optimized rotary flux compressors for powering laser flashlamps.** Carder, B.; Lundberg, R. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 5p. (CONF-830621—46). NTIS, PC A02/MF A01. Order Number DE84002794.

From IEEE power electronics specialists conference; Albuquerque, NM, USA (6 Jun 1983).

Two ARFC's were optimized with the LLNL code. The large machine had a 42-inch diameter rotor. It provided 14 MJ of energy to a flashlamp load in a 900 $\mu$sec, 16 GW pulse. Its mass was 30 tonnes. The small machine provided a peak power of 8 GW in a 590 $\mu$sec pulse, and delivered 5.4 MJ to the flashlamp load. Its mass was 13 tonnes. The parameters of these optimized machines are summarized in Table 1. Both of these devices were 8 pole ARFC's with two turns per pole.

4197 **(UCRL—89195) Issues in radioactivity for fusion energy: remote maintenance rating.** Dorn, D.W.; Maninger, R.C. (Lawrence Livermore National Lab., CA (USA)). 14 Sep 1983. Contract W-7405-ENG-48. 26p. (CONF-831203—1). NTIS, PC A03/MF A01. Order Number DE83018180.

From 10. symposium on fusion engineering; Philadelphia, PA, USA (5 Dec 1983).

Recent technical progress in fusion research has been sufficient to encourage the development of conceptual designs for fusion power systems. These design efforts suggest that more attention should be paid to the safety and environmental effects of the radioactivity induced in the structural materials by the fusion neutrons. In particular, radioactivity from neutron activation of the structural components of a fusion power system will be a concern for occupational exposure of personnel. Careful choice of structural materials can significantly reduce this exposure. We propose the Remote Maintenance Rating (RMR) as a numerical means of comparing materials and machine designs with respect to occupational exposures. The RMR is defined as the dose rate at the surface of a uniformly activated, thick, infinite slab with the same composition and density as the machine component. We used the RMR rating system to evaluate the suitability of several different iron-based alloys. The specific fusion power system design used in our evaluation was a conceptual design from the Mirror Advanced Reactor Study (MARS). We determined that HT-9 is significantly better in terms of radiological dose rates at early times than the other iron-based alloys (by a factor of 3 to 7). We also calculated the behavior of both silicon carbide (SiC) and aluminum (Al), two low activation materials often proposed for reactors.

4198 **(UCRL—89327) Control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment.** Turner, W.C.; Nexsen, W.E.; Allen, S.L.; Hooper, E.B.; Hunt, A.L.; Lang, D.D.; Margolies, D.S.; Pickles, W.L.; Simonen, T.C. (Lawrence Livermore National Lab., CA (USA)). 26 Oct 1983. Contract W-7405-ENG-48. 6p. (CONF-831171—12). NTIS, PC A02/MF A01. Order Number DE84002722.

From American Vacuum Society meeting; Boston, MA, USA (1 Nov 1983).

Rate equations for the plasma species in a thermal barrier end plug establish an upper bound on the neutral pressure (P) external to the plasma. For the Tandem Mirror Experiment-Upgrade (TMX-U), this bound is $P \leqq 0.5 - 1.0 \times 10^{-6}$ Torr. Initially TMX-U did not satisfy this criterion, and axial end plugging of plasma losses seemed limited by the excessive pressure. Subsequently, we modified the machine to improve the vacuum conditions, decreasing P to the desired range. At the same time axial end plugging of plasma losses increased to the duration of neutral beam injection and ECRH heating. Here we summarize our experimental measurements of gas input.

4199 **(UCRL—89844) Photodetachment technology.** Fink, J.H. (Lawrence Livermore National Lab., CA (USA)). 1983. Contract W-7405-ENG-48. 16p. (CONF-831180—1). NTIS, PC A02/MF A01. Order Number DE84002727.

From 3. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (14 Nov 1983).

This report gives an analysis of a neutral beam line formed of negative ions and stripped in a photoneutralizer. Estimates are made of its performance when neutralized by an atomic-iodine laser.

4200 **Helical axis stellarators with noninterlocking planar coils.** Reiman, A.H.; Boozer, A.H. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physics of Fluids;* **26**: No. 11, 3167-3169(Nov 1983). Contract AC02-76CH03073.

The properties of helical axis stellarator fields generated by unlinked, planar coils are described. It is shown that such fields can have a magnetic well and large rotational transform, implying large equilibrium and stability beta limits.

4201 **Mass-ablation rates in a spherical laser-produced plasma.** Tarvin, J.A.; Fechner, W.B.; Larsen, J.T.; Rockett, P.D.; Slater, D.C. (KMS Fusion, Incorporated, Ann Arbor, Michigan 48106). *Physical Review Letters;* **51**: No. 15, 1355-1358(10 Oct 1983).

Measurements of the rate at which 1.05-μm light ablates material from spherical targets are reported for absorbed intensities between $4 \times 10^{13}$ and $4 \times 10^{14}$ W/cm². At $4 \times 10^{14}$, the ablation rate is twice as high as has been reported for planar targets. A steady-state model which includes inhibited thermal transport matches the data well.

4202 **Initial wall conditioning in Doublet III.** Jackson, G.L.; Clausing, R.E.; Lietzke, A.F.; Ejima, S.; Emerson, L.C.; Heatherly, L. (GA Technologies Inc., San Diego, California 92138). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* **1**: No. 4, 1861-1867(Oct 1983). Contract AT03-76ET51011.

The first year of operation of Doublet III, a large noncircular tokamak (R = 1.43 m, a = 0.45 m, B/sub T/ < or =2.6 T), was highlighted by the achievement of a plasma current in excess of 2 MA. This is partially attributed to the low Z/sub eff/ discharges made possible by wall conditioning using low temperature, low power discharge cleaning, accompanied by preconditioning of the wall and by baking. Approximately 500 h of hydrogen discharge cleaning and 25 h of oxygen discharge cleaning combined with tokamak plasma operations were required to obtain these low Z/sub eff/ tokamak discharges. During the initial cleanup of the wall, copious quantities (>100 monolayers) of carbon were removed, ultimately with greatest efficiency by oxygen discharge cleaning. During the conditioning process, monitoring the impurity removal rate with the residual gas analyzer (RGA) provided the most understandable measure of the rate of the cleanup, while an in situ Auger analysis surface diagnostic supplied and operated by ORNL was most useful in identifying the presence of heavy hydrocarbons (oil), carbides, and oxygen on the wall and monitoring the transport of limiter materials.

4203 **Heat transport with cold and hot electrons allowing for flux limitation by Shvarts' method.** Shkarofsky, I.P. (MPB Technologies, Inc., Dorval, Quebec H9P 1J1, Canada). *Physics of Fluids;* **26**: No. 10, 3131-3137(Oct 1983). Contract AC08-81DP40162.

The analysis of Shkarofsky on hot-electron transport is extended to include a variable degree of collisionality and gradient scale length. An extended version of the method of Shvarts et al. [Phys. Rev. Lett. 47, 247 (1981)] is used whereby the perturbed electron velocity distribution is limited in magnitude to the unperturbed part when the former becomes larger than the latter. A Maxwellian distribution is adopted for the hot electrons. For the cold electrons, either a Maxwellian, [exp(-v²/v²/sub c/)], or an exp(-v⁵/v⁵/sub c/) variation is used. The heat flow has coefficients proportional to gradients in cold- and hot-electron density, to gradients in cold- and hot-electron temperature, and the free-streaming contribution. These contributions are summed for two sample sets of scale lengths. One set of results shows that in an intermediate range of collisionality, heat inhibition occurs, in that the flux limiter is decreasing substantially below the free-streaming value, rather than increasing monotonically towards the collisionless regime.

4204 **Intense relativistic electron beam injector system for tokamak current drive.** Bailey, V.L.; Creedon, J.M.; Ecker, B.M.; Helava, H.I. (Physics International Company, San Leandro, California 94577). *Journal of Applied Physics;* **54**: No. 4, 1656-1665(Apr 1983). Contract AM03-76SF00010.

We report experimental and theoretical studies of an intense relativistic electron beam (REB) injection system designed for tokamak current drive experiments. The injection system uses a standard high-voltage pulsed REB generator and a magnetically insulated transmission line (MITL) to drive an REB-accelerating diode in plasma. A series of preliminary experiments has been carried out to test the system by injecting REBs into a test chamber with preformed plasma and applied magnetic field. REBs were accelerated from two types of diodes: a conventional vacuum diode with foil anode, and a plasma diode, i.e., an REB cathode immersed in the plasma. REB current was in the range of 50 to 100 kA and REB particle energy ranged from 0.1 to 1.0 MeV. MITL power density exceeded 10 GW/cm². Performance of the injection system and REB transport properties is documented for plasma densities from 5 x $10^{12}$ to 2 x $10^{14}$ cm$^{-3}$. Injection system data are compared with numerical calculations of the performance of the coupled system consisting of the generator, MITL, and diode.

4205 **Fusion reactor design-III. Report on the third IAEA technical committee meeting and workshop, Tokyo, Japan, 5-16 October 1981.** Iso, Y. (Japan Atomic Energy Research Inst., Tokyo); Stacey, W.M. Jr. (Georgia Inst. of Tech., Atlanta (USA)); Kulcinski, G.L. (Wisconsin Univ., Madison (USA)); Krakowski, R.A. (Los Alamos National Lab., NM (USA)); Carlson, G.A. (Lawrence Livermore National Lab., CA (USA)); Yamanaka, C. (Osaka Univ. (Japan)); Casini, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre); Igata, N. (Tokyo Univ. (Japan)). pp 3-4 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Abstract only. The full report is published in Nucl. Fusion (May 1982) v. 22(5) p. 671-719.

4206 **Engineering aspects of the INTOR design.** Shannon, T.E. (Oak Ridge National Lab., TN (USA)). pp 103-114 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/6).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

The INTOR engineering design has been strongly influenced by considerations for assembly and maintenance. A maintenance philosophy was established at the outset of the conceptual design to insure that the tokamak configuration would be developed to accommodate maintenance requirements. The main features of the INTOR design are summarized in this paper with primary emphasis on the impact of maintenance considerations. The most apparent configuration design feature is the access provided for torus maintenance. Particular attention was given to the size and location of superconducting magnets and the location of vacuum boundaries. All of the poloidal field (PF) coils are placed outside of the bore of the toroidal field (TF) coils and located above and below an access opening between adjacent TF coils through which torus sectors are removed. A magnet structural configuration consisting of mechanically attached reinforcing members has been designed which facilitates the open access space for torus sector removal. For impurity control, a single null poloidal divertor was selected over a double null design in order to maintain sufficient access for pumping and maintenance of the collector. A double null divertor was found to severely limit access to the torus with the addition of divertor collectors and pumping at the top. For this reason, a single null concept was selected in spite of the more difficult design problems associated with the required asymmetric PF system and higher parti-

cle loadings. Tokamak support systems and the reactor building and facilities are also important to the overall design evolution and were included in the conceptual design effort. However, this paper discusses only the primary tokamak systems.

4207 **Near-term tokamak reactor designs with high performance resistive magnets.** Cohn, D.R.; Bromberg, L.; Williams, J.E.C.; Becker, H.; Leclaire, R.; Yang, T. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). pp 173-184 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/11).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

A wide range of designs of near term tokamak reactors with high performance resistive magnets has been studied. High fields, obtainable in the near term only from resistive magnets, are used to provide high values of ntausub(E) and fusion power density, and to facilitate operation in the DD-DT advanced fuel mode. Magnet shielding requirements can be significantly reduced relative to those for superconducting magnets. Advanced Fusion Test Reactors (AFTR) designs have been developed using BITTER type magnets which are capable of steady state operation. The goals of compact AFTR designs (with major radii R approx.=2.5 - 4 m), include DT ignition with large physics margins; high duty cycle, long pulse operation; and DD-DT operation with low tritium concentration. Larger AFTR designs (R approx.=5m), have the additional goal of early demonstration of self sufficiency in tritium production. The AFTR devices could also serve as prototypes for commercial reactors. Compact ignition test reactors have also been designed (R approx.=1 - 2m). These designs use BITTER magnets that are inertially cooled starting at liquid nitrogen temperature. A detailed engineering design was developed for ZEPHYR.

4208 **Status of TFTR construction and proposed research plan.** Little, R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 221-228 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/14).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

TFTR is a large pulsed circular tokamak with R approx.=2.5 m, a approx.=1 m 20 copper TF coils producing an on-axis field of 5 T, and a large N.B. auxiliary heating system. The use of D-T plasma mixtures is a major goal of the project. TFTR is presently in a component fabrication phase, but is rapidly changing to the assembly and installation one. Facility buildings are close to completion and partial occupancy by PPL is in effect. All major components of the tokamak are in an advanced state of fabrication. The vacuum vessel is the critical-path item for initial plasma operation presently expected in August 82. One M.G. set is ready for test, but the second one was damaged in a crane failure. Other electrical components are being fabricated or installed. The present research plan incorporates an initial one-year period of ohmic heating and plasma control tests, and installation of three neutral beam injectors. There will be an extended period of optimizing the machine performance with hydrogen plasmas. This will include additional heating capabilities such as a fourth N.B. injector, ICRH coupler tests, and will last roughly two years. It will be followed by a demonstration D-T plasma effort, the aim being to achieve Q approx.=1 (a peak fusion output power equivalent to the N.B. input power). The next phase of experimentation will include major investigations which should be relevant to future machines. This phase includes a large ICRF heating system, pumped limiters, plasma current drive and longer pulse length operation, and will last two years by which time remote handling schemes will have been tested, and radiation shielding completed. The final phase will start in 1988 and concentrate on maximizing the D-T output from the tokamak. A lithium blanket module is being designed and will be installed for the demonstration D-T plasma effort.

4209 **Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant.** Varljen, T.C.; Chi, J.W.H.; Karbowski, J.S. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.); Fillo, J.A.; Powell, J.M.; Benenati, R. (Brookhaven National Lab., Upton, NY (USA)). pp 313-323 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/18).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Brookhaven National Laboratory has been engaged in a scoping study to investigate the potential merits of coupling a fusion reactor with a high temperature blanket to a high temperature electrolysis (HTE) process to produce hydrogen and oxygen. Westinghouse is assisting this study in the areas of systems design integration, plasma engineering, balance of plant design and electrolyzer technology. The aim of the work done in the past year has been to focus on a reference design point for the plant, which has been designated HYFIRE. In prior work, the STARFIRE commercial tokamak fusion reactor was directly used as the fusion driver. This report describes a new design obtained by scaling the basic STARFIRE design to permit the achievement of a blanket power of 6000 MWt. The high temperature blanket design employs a thermally insulated refractory oxide region which provides high temperature (>1000 deg. C) steam at moderate pressures to high temperature electrolysis units. The electrolysis process selected is based on the high temperature, solid electrolyte fuel cell technology developed by Westinghouse. An initial process design and plant layout has been completed; component cost and plant economics studies are now underway to develop estimates of hydrogen production costs and to determine the sensitivity of this cost to changes in major design parameters.

4210 **ELMO Bumpy Torus fusion reactor design study.** Bathke, C.G.; Krakowski, R.A. (Los Alamos National Lab., NM (USA)). pp 359-375 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/21).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

A complete power plant design of a 1200-MWe ELMO Bumpy Torus Reactor (EBTR) is described that emphasizes those features that are unique to the EBT confinement concept, with subsystems and balance-of-plant items that are generic to magnetic fusion being adopted from past, more extensive tokamak reactor designs.

4211 **Compact-Toroid Fusion Reactor (CTOR) based on the field reversed theta pinch.** Hagenson, R.L. (Technology International, Inc., Ames, IA (USA)); Krakowski, R.A. (Los Alamos National Lab., NM (USA)). pp 377-390 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/22).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Scoping studies of a translating Compact Torus Reactor (CTOR) have been made on the basis of a dynamic plasma model and an overall systems approach. This CTOR embodiment uses a Field-Reversed Theta Pinch as a plasma source. The field-reversed plasmoid would be formed and compressionally heated to ignition prior to injection into and translation through a linear burn chamber, thereby removing the high-technology plasmoid source from the hostile reactor environment. Stabilization of the field-reversed plasmoid would be provided by a passive conducting shell located outside the high-temperature blanket but within the low-field superconducting magnets and associated radiation shielding. On the basis of this batch-burn but thermally steady-state approach, a reactor

concept emerges with a length below approx. 40 m that generates 300-400 MWe of net electrical power with a recirculating power fraction less than 0.15.

4212 **Recent studies of reversed-field pinch reactors.** Hagenson, R.L. (Technology International, Inc., Ames, IA (USA)); Krakowski, R.A. (Los Alamos National Lab., NM (USA)). pp 391-406 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/23).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

The reactor prognoses of a class of confinement schemes that rely primarily on self-fields induced by axial currents flowing within a plasma column are presented. The primary focus has been placed on the toroidal Reversed-Field Pinch (RFP). At the limit of very large current densities is the gas-embedded Dense Z-Pinch (DZP), a small-radius, linear device. Past "conventional" RFP reactor designs are reviewed. The extension of these "conventional" RFP reactors to DD advanced-fuel operation is described. The implications are summarized of operating higher-density, compact RFPs as reactors, wherein the current density rather than physical dimensions are scaled. Lastly, the application of very high current densities supported in a sub-millimeter linear current channel, as embodied in the DZP reactor, is reviewed.

4213 **Designs of tandem mirror fusion reactors.** Carlson, G.A.; Barr, W.L.; Boghosian, B.M. (California Univ., Livermore (USA). Lawrence Livermore National Lab.) (and others). pp 443-456 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/26).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

We have completed a comparative evaluation of several end plug configurations for tandem mirror fusion reactors with thermal barriers. The axi-cell configuration has been selected for further study and will be the basis for a detailed conceptual design study to be carried out over the next two years. The axi-cell end plug has a simple mirror cell produced by two circular coils followed by a transition coil and a yin-yang pair, which provides for MHD stability.

4214 **Westinghouse ICF power plant design.** Sucov, E.W. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). pp 515-526 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/30).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

This study of commercial power plants based on ICF drivers examined the technological problems that need to be confronted and solved in order to produce commercially competitive electricity acceptable to utilities. Two conceptual designs, one based on a $CO_2$ laser driven and one on a heavy ion particle beam driver, were developed. Analytic descriptions of the performance and cost relationships for each of the subsystems that comprise the power plant were combined into an overall computer code which modeled the entire plant and permitted trade studies to be conducted. The subsystems of the power plants include driver, pellet fabrication, pellet injection, first wall protection, first wall and structure, heat removal, tritium breeding, neutron shielding, maintenance and repair. The emphasis of the effort was on designing a viable reactor cavity and on solving the problems of interfacing the driver systems with the reactor cavity. Averaged surface heating due to X-ray and ion pulses from the pellet explosion is carried away by flowing lithium in tubes of HT-9 steel, which constitute the first wall. Protection of the first wall against the extreme temperature transients caused by these pulses is provided by a thin Ta coating. Analysis of these transients using a hydrodynamic and radiation transport code coupled with realistic equations of state for the Ta show: (1) the maximum temperature reached by the tantalum surface is 400 K below its melting point so spallation and evaporation are unlikely, and (2) the high temperatures do not penetrate deeply into the coating so there will be little thermal cycling at the steel-tantalum interface. This "dry wall" protection concept is uniquely compatible with beam transport requirements of all ICF drivers including lasers, light ions and heavy ions.

4215 **DTHR and CTHR: A review of two recent tokamak fusion-fission hybrid reactor design studies.** Varljen, T.C.; Rose, R.P. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). pp 529-543 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/31).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

This paper describes the results of two recent reactor design studies for a Demonstration Tokamak Hybrid Reactor (DTHR) and a Commercial Tokamak Hybrid Reactor (CTHR). The DTHR is envisioned as a relatively near term engineering demonstration of hybrid feasibility. The tokamak driver was derived from prior TNS studies and is similar in many respects to current FED/ETF/INTOR concepts. The tokamak employs an elongated plasma with major and minor radii of 5.2 and 1.2 m, respectively. The toroidal and poloidal field coil systems both use superconducting $Nb_3Sn$ windings. A bundle divertor is used for plasma exhaust and impurity control. The DTHR blanket could be used as a test bed for a number of blanket concepts simultaneously. The reference concept is based on uranium or thorium oxide based fertile material and water cooling to take maximum advantage of existing LWR technology in this early demonstration. The reference CTHR design is intended to represent an integrated first generation (but not first-of-a-kind) commercial fusion-fission hybrid plant which is a logical extension of the state of the art of both the fusion driver and hybrid blanket technologies. While the groundrules of this study were quite similar to those used for STARFIRE, the approach taken in the CTHR work was somewhat more conservative in terms of plasma physics and the performance and cost of components.

4216 **Feasibility study of a fission suppressed blanket for a tandem mirror hybrid reactor.** Moir, R.W.; Lee, J.D.; Barr, W.L. (California Univ., Livermore (USA). Lawrence Livermore National Lab.) (and others). pp 545-567 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/32).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

A study of fission suppressed blankets for the tandem mirror not only showed such blankets to be feasible but also to be safer than fissioning blankets. Such hybrids could produce enough fissile material to support up to 17 light water reactors of the same nuclear power rating. Beryllium was compared to $^{7}Li$ for neutron multiplication; both were considered feasible but the blanket with Li produced 20% less fissile fuel per unit of nuclear power in the reactor. The beryllium resource, while possibly being too small for extensive pure fusion application, would be adequate (with carefully planned industrial expansion) for the hybrid because of the large support ratio, and hence few hybrids required. Radiation damage and coatings for beryllium remain issues to be resolved by further study and experimentation. Molten salt reprocessing was compared to aqueous solution reprocessing (thorex and purex). The cost of bred fissile material ($^{233}U$) expressed as an equivalent $U_3O_8$ cost was $89/lb for the Li case with molten salt reprocessing, $76/lb for the beryllium case with aqueous reprocessing, and $63/lb for the beryllium-molten salt design. $75/lb for $U_3O_8$ is equivalent to $50-60/g of $^{233}U$. A hybrid whose nuclear power rating is 4000 MW can produce 6000 kg/y of $^{233}U$. This is enough to provide make up

fuel for 15 LWR's containing no thorium (only $^{238}U$ plus recycled $^{233}U$ and $^{239}Pu$) each rated at 4000 MW nuclear. The system of 15 LWR's plus 1 hybrid (estimated to cost 3.5 times that of an LWR) would produce electricity at a cost of less than 10% more than an LWR which bought $U_3O_8$ at $45/lb. The electricity would cost the same for an LWR using $U_3O_8$ costing $75/lb.

4217 **Low activation fusion reactor design.** Hopkins, G.R.; Cheng, E.T.; Wong, C.P.C.; Maya, I.; Schultz, K.R. (General Atomic Co., San Diego, CA (USA)). pp 569-579 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/33).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

One of the primary reasons for development of fusion energy is the potential fusion has to provide an inherently safe source of nuclear energy. The fusion process, however, releases a highly energetic neutron which will create radioactive activation products in the material surrounding the plasma. Assessment of the amounts of radioactivity indicate they can be similar to those of a fission reactor. A unique aspect of the radioactivity associated with fusion is that it is not inherent to the fusion reaction. By choosing low activation materials such as aluminum, beryllium, silicon carbide, carbon, lithium oxide, helium and water, the radioactivity can be reduced by factors of more than a million below that of a fission reactor. We have done a design study to investigate the implications of using low activation materials in a fusion power reactor. The STARFIRE reactor was used as a model. Low activation design concepts were studied for the four major regions of a fusion reactor: first wall and limiter, blanket, shield, and magnet windings. The first wall and limiter are made of water-cooled aluminum. The blanket uses an unpressurized silicon carbide structure containing $Li_2O$ breeding material with high temperature, high pressure helium coolant contained in SiC "thimble tubes". The shield is made of SiC and $B_4C$ with an aluminum structure. The superconducting magnets use an aluminum stabilizer and aluminum or carbon fiber epoxy composite for the structure and dewar. Analysis of the design indicates that the activation and dose rate levels and the quantities of radioactive material to be disposed of are reduced by up to six orders of magnitude compared to the reference design. Although access to the plasma chamber is not possible, contact maintenance at the back of the blanket would be allowed. The low activation concept can thus allow fusion to provide an inherently safe and environmentally acceptable source of energy with a low level of residual radioactivity.

4218 **Advanced fuel concepts and applications.** Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). pp 15-28 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/36).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Despite their more stringent plasma heating and confinement requirements, advanced fuel (AF) fusion cycles potentially offer improved environmental compatibility and lower costs. This comes about by elimination of tritium breeding requirements and by a reduction in neutron flux (hence, activation and radiation damage). Also a larger energy fraction carried by charged particles makes direct energy conversion more suitable. As a first application, a symbiotic system of semi-catalyzed-deuterium fueled hybrid fuel factories, supplying both fissile fuel to light water reactors and $^3He$ to D-$^3He$ "satellite" fusion reactors, is proposed. Subsequently, an evolution into a system of synfuel factories with satellite D-$^3He$ reactors is envisioned.

4219 **First wall and blanket engineering development for magnetic fusion reactors.** Baker, C.; Herman, H.; Maroni, V.; Turner, L.; Clemmer, R.; Finn, P.; Johnson, C.; Abdou, M. (Argonne National Lab., IL (USA)). pp 115-135 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/43).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

The purpose of the First Wall/Blanket/Shield (FW/B/S) Engineering Test Program is to establish an engineering data base derived from realistic models and facsimile testing. The program defines the performance characteristics for the Fusion Engineering Device (FED) and a Fusion Demonstration Plant (FDP). The first wall element is concerned with thermo-mechanical testing. Tests are being conducted for normal heat flux conditions (10-100 W/cm$^2$) and off-normal conditions such as plasma disruptions (100-300 MW/m$^2$). The blanket element is concerned with studies on how to simulate fusion neutron bulk heating effects in blankets using non-nuclear techniques and fission reactors. In addition, a facility is being constructed at ANL for electromagnetic testing of FW/B/S components. The assembly/maintenance/repair (AMR) element of the program is now focusing on preparation of a designer's guide book and development of vacuum and coolant penetrations and connectors. Industrial participation in this activity includes Westinghouse Electric Corporation; General Atomic Company; EG and G Idaho, Inc.; McDonnell Douglas Astronautics Company (MDAC); and Remote Technology Corporation. Current activities in the breeder blanket development program are focused on a number of solid breeders and include: (1) preparation and fabrication; (2) measurement of thermochemical properties and phase equilibria; (3) studies of compatibility of candidate structural materials with solid breeders; (4) determination of thermal diffusivity and thermal conductivity; and (5) small-scale neutron irradiation and tritium extraction tests for $Li_2ZrO_3$ and $Li_2TiO_3$.

4220 **Progress in engineering simulation testing of fusion reactor first wall components.** Varljen, T.C.; Chi, J.W.H. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.); Herman, H. (Argonne National Lab., IL (USA)). pp 137-148 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/44).

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Test Program Element -I (TPE-I) of the First Wall/Blanket/Shield Engineering Test Program conducted by the Argonne National Laboratory will focus on providing experimental facilities and the conduct of experiments required to develop the data base necessary to design first wall and limiter systems for fusion reactor applications. Initial first wall experiments are scheduled to begin in October, 1981. This paper is a summary of the plans which have been developed for this program and a status report on the preparation of the facilities designed to provide a suitable testing environment. The Fusion Power Systems Department of the Westinghouse Electric Corporation is the lead industrial participant for TPE-I. Two test facilities will be implemented, both based on the use of high power electron beams to provide surface heat loads in the range of interest for fusion reactor applications. The initial focus of the test program will be primarily on the thermal-hydraulic and thermal-mechanical response of candidate first wall and limiter components to high surface heat loads, excluding, for the time being, such additional effects as surface erosion, sputtering and radiation damage. The first series of first wall component tests have been planned and four types of test pieces have been designed and are now being fabricated. These test pieces are based on current Fusion Engineering Device (FED) first wall and limiter concepts. Both steady state and rapid transient (disruption) heat loads will be applied to these test articles, bracketing FED operating conditions. A program of metallographic examination has also been planned to

correlate structural and microstructural changes with the imposed head loads.

4221 **Cyclic thermal stresses in fusion reactors.** Bohachevsky, I.O. (Los Alamos National Lab., NM (USA)); Kostoff, R.N. (Department of Energy, Washington, DC (USA). Office of Energy Research). pp 149-160 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/45).

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In this paper we model and analyze cyclic thermal loads and stresses in two critical components of inertial and magnetic confinement fusion reactors (including fusion-fission hybrids); namely, in the solid wall adjacent to the fusion plasma ("first wall") and in the fuel elements located in the high power density region of the blanket. We derive explicit expressions for the parametric dependencies of thermal stresses that provide a quantitative basis for tradeoff and comparative assessment studies of different fusion reactors.

4222 **Fusion materials. Adapting to realistic reactor environments.** Kulcinski, G.L. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). pp 353-376 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/60).

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There has been considerable movement in the fusion materials field since the last International Workshop on Reactor Design was held in Madison (1977). Some of the movement has been forward: e.g., we now have much better theoretical descriptions of the melting, vaporization, and electromechanical stresses imposed on first wall material during plasma disruptions. Some of the movement has been "sideways", e.g., the Fusion Materials Irradiation Test Facility (FMIT) now has slipped 3 years in its schedule since the last conference 4 years ago. Finally, there has been very little progress in the fields of pulsed damage simulation for Inertial Confinement Fusion (ICF) Systems, definition of the radiation spectra from ICF targets, or the experimental determination of disruption characteristics for magnetic fusion devices. Several new ideas have appeared since 1977 such as the use of low swelling martensitic alloys, the use of a much more favorable breeding material, $Pb_{83}Li_{17}$, and there have been two major efforts to design materials test facilities: INTOR and TASKA.

4223 **Critical plasma-materials issues for fusion reactor designs.** Wilson, K.L.; Bauer, W. (Sandia National Labs., Livermore, CA (USA)). pp 377-387 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/61).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Plasma-materials interactions are a dominant driving force in the design of fusion power reactors. This paper presents a summary of plasma-materials interactions research. Emphasis is placed on critical aspects related to reactor design. Particular issues to be addressed are plasma edge characterization, hydrogen recycle, impurity introduction, and coating development. Typical wall fluxes in operating magnetically confined devices are summarized. Recent calculations of tritium inventory and first wall permeation, based on laboratory measurements of hydrogen recycling, are given for various reactor operating scenarios. Impurity introduction/wall erosion mechanisms considered include sputtering, chemical erosion, and evaporation (melting). Finally, the advanced material development for in-vessel components is discussed.

4224 **Safety considerations in fusion reactor design.** Crocker, J.G. (Idaho National Engineering Lab., Idaho Falls (USA)). pp 413-427 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vienna, Austria; International Atomic Energy Agency (1983). (CONF-811046—Vol.1; IAEA-TC—392/64).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

Nuclear fusion as a source of commercial power is on the threshold of the transition from scientific experimentation to commercial application. This transition is marked by the increased attention that will be given to engineering experiments in the next generation of fusion devices. This transition will also be accompanied by the introduction of experiments that make significant use of the deuterium-tritium (D-T) reaction. The use of the D-T reaction in fusion reactor designs results in several safety problems that must be resolved in the reactor design process. The most significant safety issues for D-T burning reactors involve minimization and control of radioactive inventories. These inventories are tritium and activation products that are produced by the interaction of fusion reactor materials with high energy neutrons produced in the fusion reaction. Some of the more significant design issues arising from the presence of these inventories include 1) minimizing the radioactive inventories, 2) control of routine and accidental releases, 3) shielding, 4) containment design, 5) maintenance in high radiation environment, 6) instrumentation, and 7) waste management. Current fusion reactor designs involve a complex interaction of systems required for confinement, heating and control of the plasma, tritium breeding, heat removal, energy conversion, shielding, and maintenance. Many of these systems contain large quantities of stored energy that potentially could result in radioactive release under certain accident conditions. This paper discusses key safety issues involved with D-T burning fusion reactor designs and design solutions that can be employed to eliminate or reduce the potential for adverse consequences to operating personnel, the general public, and the environment.

4225 **UWTOR-M, a stellarator power reactor utilizing modular coils.** Sviatoslavsky, I.N.; Van Sciver, S.W.; Kulcinski, G.L. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). pp 327-342 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vol. 1. Vienna, Austria; IAEA (1983). (CONF-811046—; IAEA-TC—392/19).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

A preliminary design of a 5500 MWsub(th) modular stellarator power reactor, UWTOR-M, is presented. We briefly describe the parametric considerations which led to the UWTOR-M reference design point. The design has 18 twisted coils utilizing a multipolarity of 3, a major radius of 24 m, a coil radius of 4.77 m and a plasma aspect ratio of 14. An assumed $\beta$ of 5% was used. This configuration leads to a rotational transform on the edge of 1.125 giving favourable plasma physics conditions. The natural stellarator divertor is used for impurity control in conjunction with innovative high performance divertor targets. A unique blanket design is proposed which minimizes tritium inventory in the reactor. Finally, since maintainability is a prime consideration, we describe a scheme for servicing the first wall/blanket and other reactor components.

4226 **Experimental investigation of the spheromak configuration.** Yamada, M.; Ellis, R. Jr.; Furth, H.P. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 265-280 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/M-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The characteristics of the spheromak configuration have been intensively investigated on the basis of three different formation schemes. Significant progress has been obtained in the areas of control of gross MHD instability and impurity influx. The parameters of spheromak plasmas have been improved and are in the range of Bsub(t) approx.= Bsub(p) <or approx. 5kG, Tsub(e) <or approx. 50eV, $3x10^{13}$ <nsub(e)< $10^{15}cm^{-3}$, with the longest lifetime of 1 ms.

4227 **Inertial fusion research based on pulsed power.** Yonas, G. (Sandia National Labs., Albuquerque, NM (USA)). pp 353-360 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/N-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

PBFA II, with design parameters of 3.5 MJ and 100 TW, is being designed to allow inertial fusion ignition experiments using imploding foils or light ion beams. Flexibility is being retained to implode a cylindrical foil through magnetically insulated power concentration at 30 MA or to drive one or more ion diodes operating in the 10 MV range. In both cases the goal is to deliver 100 $TW.cm^{-2}$ and 1 MJ to a target in order to investigate ignition and possibly breakeven. Imploding foil data on Proto II have demonstrated that electromagnetic energy can be efficiently converted into foil kinetic energy with the output increasing as the square of the foil current. Experiments at Sandia National Laboratories have reached 60 kJ at 5 MA with the foil imploding in 80 ns and stagnating in 10 ns. This implosion demonstrates adequate stability, and modelling has shown that this behaviour should extrapolate to higher currents if the implosion time is less than 100 ns. To extend the scaling data to 8 MA, Proto II has been modified by extending magnetic insulation to inhibit insulator flashover. One-TW proton diodes have delivered about 2 $TW.cm^{-2}$ to 3 mm diameter targets using ballistic focusing limited by beam divergences of typically 20 mrad. This divergence is induced by instabilities in the electron-ion flow, non-uniformities in the anode plasma, or a combination of these effects. Further increases in intensity can be achieved with increases in voltage and ion mass, as well as with beam bunching. Analytical models indicate that beam focusing increases with the square of the voltage and that heavier ions such as $C^{+2}$ or $Li^{+1}$ are required to obtain the correct stopping power at >10 MV. Correlation with analytical scaling models and electromagnetic code simulations is continuing. PBFA II will be capable of operating over a wide voltage range to accommodate the different options, with scaling experiments on PBFA I providing the basis for the selection.

4228 **Light-ion inertial confinement fusion research at Naval Research Laboratory.** Cooperstein, G.; Colombant, D.G. (Naval Research Lab., Washington, DC (USA)); Barker, R.J. (JAYCOR, Alexandria, VA (USA)). pp 361-369 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/N-2).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

High-brightness proton beams (0.4 MA, 1 MV) have recently been extracted from 20 $cm^2$ axial pinch-reflex diodes (PRDs) mounted on the NRL Gamble II generator. A source power brightness of >=10 $TW.cm^{-2}.rad^{-2}$ was achieved in these experiments. A new barrel-shaped equatorial PRD that can be coupled to PBFA II has also been operated on Gamble II and has demonstrated 50% proton efficiency with predominantly azimuthally symmetric charged-particle flow. In other experiments the stopping power of deuterons in hot plasmas was measured using a PRD on Gamble II. Results show about 40% increase in stopping power over that in cold targets when the beam was focused to about 0.25 $MA.cm^{-2}$. Research is also being performed on transporting ion beams in large-diameter channels (>or approx. 2.5 cm) and on a post-transport plasma-filled magnetic focusing section to bring the beam to pellet dimensions.

4229 **Research progress in intense ion beam production for inertial confinement fusion at Cornell University.** Bluhm, H.; Greenly, J.B.; Hammer, D.A. (Cornell Univ., Ithaca, NY (USA). Lab. of Plasma Studies). pp 371-380 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/N-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Recent results obtained in the generation of intense pulsed light ion beams and their application to inertial confinement fusion are described. Studies of time-integrated and time-dependent beam divergence using a magnetically insulated ion diode with a "flashboard" anode at <or approx.$10^{11}$ W diode power show a directionality which is apparently due to electron dynamics in the diode. Nevertheless, ion beams having divergence angle as small as 0.5° have been produced at $>10^{8}$ $W.cm^{-2}$. In another experiment with a similar diode, the anode plasma formation time varied with the detailed anode configuration, the diode voltage and the insulating magnetic field, with the longer times obtained at lower voltage and higher insulating magnetic field strength. The anode plasma density was determined to be in the $10^{15}$ $cm^{-3}$ density range and to move away from the anode at approx.2 $cm.\mu s^{-1}$ in another similar experiment. Preliminary experiments performed on a $10^{12}$ W accelerator show reasonable power coupling to a magnetically insulated ion diode, with $>10^{9}$ $W.cm^{-2}$ beams at approx.1.5 MV being generated. Computer simulations suggest that if such a beam can be focused into a plasma channel, most of its energy can be delivered to a pellet one to two metres away. In experiments on the applied Bsub(theta) diode, microwave radiation, ion production efficiency, and ion beam fluctuations all reach a maximum when the insulating magnetic field is about 1.4 times the critical field for magnetic insulation. Relatively pure beams of heavy ions have been produced by making the anode with hydrocarbon-free dielectric material. The sum of these results suggests that flashboard anodes operated at the few-MV level can be used to produce beams with properties suitable for inertial confinement fusion experiments on sufficiently powerful pulsed power generators.

4230 **Development of hydrogen pellet injectors and pellet fuelling experiments at Oak Ridge National Laboratory.** Milora, S.L.; Combs, S.K.; Foster, C.A. (Oak Ridge National Lab., TN (USA)). pp 461-470 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 2. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/O-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The introduction of high-speed hydrogen and deuterium pellet injectors of multipellet capability has allowed pellet fuelling experiments to progress beyond the demonstration stage. The paper describes various aspects of the Oak Ridge National Laboratory Pellet Fueling Program, including the development of pneumatic and mechanical (centrifugal) injector types, plasma fuelling experiments, and the numerical results of pellet ablation and transport studies.

4231 **(LA-tr—83-21) Production of negative $D^-$ ions by double charge exchange using cesium.** Delaunay, M.; Geller, R.; Jacquot, C.; Ludwig, P.; Mazhari, F.; Rocco, J.C.; Sermet, P.; Zadworny, F. (Los Alamos National Lab., NM (USA); Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Groupe de Recherches sur la Fusion Controlee). 1983. Contract W-7405-ENG-36. Translation of EUR-CEA-FC-1096, March 1981. 62p. NTIS, PC A04/MF A01. Order Number DE84002816.

The first experimental results on the source of $D^-$ negative ions developed at SIG confirm a certain number of essential points: (1) the use of a positive ion source obtained by a resonance electronic cyclotron permits the production of $D^+$ ion beams with a very small gas output, therefore it has a very good gas efficiency; (2) the supersonic cesium target obtained after the release of a high temperature cesium vapor functions perfectly with the desired characteristics; (3) the conversion efficiency measured in $D^-$ ions is close to those which were deduced from experimental cross sections; and (4) the mean density of $D^-$ ion currents is on the order of 10 mA/cm² at 1 keV. They could be 15 at 25 mA/cm² at 300 eV. This presupposes that we modify the extraction optic for the $D^+$ ions to extract 60 at 70 mA/cm² of $D^+$ at 300 eV with a maximum electric field of 30 DV/cm and a greater perveance of the optic. (MOW)

4232 **Large aperture harmonic conversion experiments at Lawrence Livermore National Laboratory.** Linford, G.J.; Johnson, B.C.; Hildum, J.S.; Martin, W.E.; Snyder, K.; Boyd, R.D.; Smith, W.L.; Vercimak, C.L.; Eimerle, D.; Hunt, J.T. (All authors were with University of California, Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, California 94550 when this work was done; G. J. Linford is now with Max-Planck-Institut fur Quantenoptik, D-8046 Garching, Federal Republic of Germany.). *Applied Optics;* **21**: No. 20, 3633-3643(15 Oct 1982). Contract W-7405-ENG-48.

Large aperture harmonic conversion experiments to $2\omega$ (532 nm), $3\omega$ (355 nm), and $4\omega$ (266 nm) on the Argus laser at the Livermore National Laboratory are described. Harmonically converted energies of up to 346 J have been generated at external conversion efficiencies of 83%. A discussion of the harmonic conversion experiments and a brief summary of enhanced $2\omega$ and $3\omega$ inertial confinement fusion target performances are provided.

4233 **Interactions between the line-connected static convertors of TEXTOR.** Griesen, B. (Association Euratom-Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)); Petree, F. (Ebasco Services, Inc., New York (USA)). pp 915-919 of Fusion technology 1980. Vol. 2. Oxford, England; Pergamon Press (1981). (CONF-800950—Vols.1,2; EUR—7035).

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

In two volumes.

This paper describes techniques used to predict and analyze the potentially harmful effects of interactions between three high-power static convertors connected to a high impedance distribution transformer, to weigh them against the benefits.

4234 **Grounding system of TEXTOR.** Schwarz, U. (Association Euratom-Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)); Neumeyer, C. (Ebasco Services, Inc., New York (USA)). pp 921-926 of Fusion technology 1980. Vol. 2. Oxford, England; Pergamon Press (1981). (CONF-800950—Vols.1,2; EUR—7035).

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

In two volumes.

The modular design of the TEXTOR grounding system is described. The resistive grounding of major components is treated in detail. An insulation test procedure is proposed by using the grounding system.

4235 **TRAIL - a tokamak rail gun limiter.** Yu, W.S.; Powell, J.R.; Usher, J.L. (Brookhaven National Lab., Upton, NY (USA)). pp 1059-1066 of Fusion technology 1980. Vol. 2. Oxford, England; Pergamon Press (1981). (CONF-800950—Vols.1,2; EUR—7035).

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

In two volumes.

An attractive new limiter concept is investigated. The TRAIL (Tokamak Rail Gun Limiter) system impacts a stream of moderate velocity pellets (100 to 200 m/sec) through the plasma edge region to absorb energy and define the plasma boundary. The pellets are recycled after cooling, to the injector of an E-M mass accelerator. Heat fluxes of approx. 30,000 W/c.m² can be readily accommodated by the pellets, with very low recirculating power requirements (approx. 0.1%) for the accelerator. The mass accelerator velocity requirements are well within the present state of the art (several Km/sec). Accelerators injecting pellets at approx. 1 Km/sec can be used to control local plasma temperature and current profiles and to act as energy absorbers to shut down the plasma without damage to the first wall if a plasma disruption occurs.

## 99 GENERAL AND MISCELLANEOUS

4236 **(BNL—33767) History and ritual events on a Petexbatun Classic Maya polychrome vessel.** Reents, D.J.; Bishop, R.L. (Brookhaven National Lab., Upton, NY (USA); Texas Univ., Austin (USA)). 12 Jun 1983. Contract AC02-76CH00016. 22p. (CONF-8306140—1). NTIS, PC A02/MF A01. Order Number DE84001773.

From Quinta Mesa Redonda de Palenque conference; Palenque, Mexico (13 Jun 1983).

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A discussion is presented of the historical ritual bloodletting which is represented on the Late Classic Maya polychrome vessel MS0651. (DLC)

4237 **(BNL—33772) Area group: an example of style and paste compositional covariation in Maya pottery.** Bishop, R.L.; Reents, D.J.; Harbottle, G.; Sayre, E.V.; van Zelst, L. (Brookhaven National Lab., Upton, NY (USA); Texas Univ., Austin (USA). Dept. of Art History; Museum of Fine Arts, Boston, MA (USA). Research Lab.). 12 Jun 1983. Contract AC02-76CH00016. 24p. (CONF-8306140—2). NTIS, PC A02/MF A01. Order Number DE84001669.

From Quinta Mesa Redonda de Palenque conference; Palenque, Mexico (13 Jun 1983).

This paper has addressed aspects of ceramic style and iconography as found in Late Classic Maya ceramic art, including the supplemental perspective afforded by the analysis of ceramic paste. The chemical data provide a means to assess the extent of stylistic-paste compositional covariation. Depending upon the strength of that covariation various inferences may be drawn about craft specialization, exchange and information flow within Maya society. At the least, it provides an empirical means of comparing stylistically similar vessels; and when they are members of a chemically homogeneous group, it permits style to be addressed in terms of its variation. Additionally, compositionally defined site or region specific reference units provide a chemical background against which the non-provenienced vessels may be compared, allowing the whole vessels to be related to the archaelogically recovered fragmentary material. Finally, this multidisciplinary approach has been illustrated by preliminary findings concerning a specific group of polychrome vessels, The Area Group.

4238 **(DOE/ER/10058—T1) Energy Research Program. Final report, 1 September 1976-28 February 1982.** (California Inst. of Tech., Pasadena (USA)). 1982. Contract FG03-76ER10058. 262p. NTIS, PC A12/MF A01. Order Number DE83017906.

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Research was performed in six areas: geochemical studies applied to development of energy resources (ability to locate resources, characterization of geothermal fluids); molecular processes associated with energy production, storage, and utilization (isotope

separation, lasers, catalysis, combustion, solar energy utilization); fluid mechanics, thermodynamics, and combustion; solar cell materials; radiation damage processes relevant to energy technology; and energy-related environmental and economic policy studies. Reports on these six areas are presented in this document. (DLC)

## 9901 Management

*REFER ALSO TO CITATION(S) 4242*

4239 **(CONF-8309125—2) Clarity in writing and editing.** Nelson, O.A. (Westinghouse Electric Corp., Madison, PA (USA)). 1983. Contract AC15-76CL50003. 10p. NTIS, PC A02/MF A01. Order Number DE84002805.

From Annual practical conference on communication; Knoxville, TN, USA (29 Sep 1983).

Writing is for reading. If you write or edit in such a way that the message is understood the first time it is read, you have succeeded where many people fail. Two ways to achieve such clarity are: 1) use commonly understood language whenever you can; 2) when you have to use special terms, define them effectively. The first way involves choice of vocabulary, appropriate technical level, and good mechanics. Definitions need to be clear, concise, and unobtrusive statements of what the terms defined mean in the context of your writing.

4240 **(DOE/EP/16004—T1) Draft issue of proposed document entitled Management Program to Assure Quality.** (NUS Corp., Gaithersburg, MD (USA)). 11 Nov 1983. Contract AC01-83EP16004. 4p. NTIS, PC A02/MF A01. Order Number DE84002286.

Material related to the existing DOE Management Program to Assure Quality was reviewed. A proposed Management Program to Assure Quality (MPAQ) document is outlined as follows: (1) Quality Assurance Policy Statement by Under Secretary; the Policy Statement will promulgate a DOE policy on QA and mandate each Program Secretarial Office preparing a formal QA program; (2) Foreword; (3) Background, (a) QA Philosophy, (b) DOE policy related to QA, (c) Purpose of MPAQ; (4) Program Development Methodology; this section will detail the process for developing a QA program tailored to the needs of the specific organization; (5) Essential Quality Assurance Elements; and appendices.

4241 **(EUR—8049-EN-Pt.2) Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies.** Love, P.E.; Michel, J. (Energy Management Centre, New York (USA); Laboratoires d'Electronique et de Physique Appliquee (LEP), 94 - Limeil-Brevannes (France)). 1983. 206p. European Community Information Service, 2100 M Street, NW, Suite 707, Washington, DC 20037.

This is an introductory exercise that looks at the use of stochastic methods as an aid to allocating resources for RD and D in the energy field. The majority of models currently developed for energy planners are usually based upon macro energy/economic linear programs. Sensitivity runs are costly and require an expert interface between the customer and the program. The macro approach does not always answer questions regarding RD and D resource allocation. Seeking to alleviate these problems lead to the development of a simple stochastic model. This form of analysis is not meant to provide detailed insights into the operation of the energy system as a whole. Its primary role is to focus upon some specific area of concern, whilst tacitly accepting the vagaries of the energy scene and dealing with them in an economical and consistent manner in order to explicitly reveal the uncertainties involved. The development of an appropriate data base provides assessments of the probabilities involved.

4242 **(LA—9875-MS) Probabilistic planning and budgeting for R & D programs involving activities of high uncertainty.** Nunz, G.J. (Los Alamos National Lab., NM (USA)). Sep 1983. Contract W-7405-ENG-36. 30p. NTIS, PC A03/MF A01. Order Number DE84002310.

A methodology is developed for probabilistic planning and budgeting in programs containing large elements of uncertainty. The model uses PERT-type temporal network analysis as a stochastic scheduling basis. Linear time dependencies are assigned to activity resources expenditures, which are combined to develop the parameters of total program budget and manpower requirement distributions. Bivariate analysis is then conducted of the joint distributions of manpower against schedule and total cost against schedule in the form of covariance ellipses. Sanguine commentary is also provided on the usefulness and pitfalls of this approach.

4243 **(ORNL—5933) Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983.** (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 178p. NTIS, PC A09/MF A01. Order Number DE84000647.

Separate abstracts were prepared for eight sections of the report: nuclear waste management; fossil energy; basic science and technology; biotechnology and environmental programs; transuranium-element processing; Nuclear Regulatory Commission programs; Three Mile Island support studies; and miscellaneous programs.

4244 **Roadmap for complex decisions.** Douglas, J.; Richels, R. *EPRI (Electric Power Research Institute) Journal;* **8**: No. 7, 6-13(Sep 1983).

Decision makers need a way of capturing the essence of complex problems, and they are increasingly turning to the formal techniques of decision analysis to frame critical decisions, ranging from national policy to building a power plant. 4 references, 2 figures, 1 table.

## 9902 Mathematics And Computers

*REFER ALSO TO CITATION(S) 2485, 2486, 2489, 2490, 2493, 2495, 2500, 2501, 3117, 3193, 3609, 4123, 4255*

4245 (CONF-8305107—, pp 91-98) **What good is Operations Research after an emergency.** George, L.L. (Lawrence Livermore National Lab., CA). 1983. NTIS, PC A13/MF A01.

From 17. Asilomar conference on fire and blast effects of nuclear weapons; Pacific Grove, CA, USA (30 May 1983).

Operations Research is ready and waiting to help after emergencies. One reason it has been used so little is no longer applicable, the lack of computer support. I recommend that emergency managers prepare the data, the programs, the operations researchers and themselves to use the support Operations Research can provide after emergencies. 70 references.

4246 **(EUR—7900) BAESNUM, a conversational computer program for the Bayesian estimation of a parameter by a numerical method.** Colombo, A.G.; Jaarsma, R.J. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1982. 43p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703817.

This report describes a conversational computer program which, via Bayes' theorem, numerically combines the prior distribution of a parameter with a likelihood function. Any type of prior and likelihood function can be considered. The present version of the program includes six types of prior and employs the binomial likelihood. As input the program requires the law and parameters of the prior distribution and the sample data. As output it gives the posterior distribution as a histogram. The use of the program for estimating the constant failure rate of an item is briefly described.

4247 **(EUR—7959) Characterization of the Dirichlet distribution as prior.** Colombo, A.G.; Costantini, D. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1982. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703818.

This paper presents a characterization of the Dirichlet distribution. The characterization is based on certain assumptions which are defined and discussed.

4248 **(ORNL/CSD—126) Two-level compromise designs for estimating main effects and detecting interactions.** Morris, M.D.; Mitchell, T.J. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE84002997.

This report describes a procedure for constructing experimental designs for use in estimating main effects, and detecting the presence of interactions in factorial models. D-optimality and tr(L)-optimality are the two design selection criteria used in constructing these compromise designs. A catalogue of compromise designs for $k = 4$ through 9 and $n = k + 2$ through $2k + 1$ is given in Appendix II, where k is the number of experimental factors and n is the number of experimental runs.

4249 **(SAND—83-1401C) COBOL programming standards at Sandia Labs.** Robinson, L. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 73p. (CONF-8310211—1). NTIS MF A01. Order Number DE84001790.

From USE conference; Orlando, FL, USA (4 Oct 1983).

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Sandia has developed an extensive set of programming standards, some of which are highlighted. These standards are designed to encourage maintainable, readable, reliable, transportable, and efficient programs. The Standards Review Committee operates as Sandia's vehicle for accommodating revisions to standards, and the methods used to implement standards include documentation, training, and structured walk-thrus.

4250 **(SAND—83-2164C) Some technical issues in geometric modeling.** Peterson, D.P. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 21p. (CONF-8311101—1). NTIS, PC A02/MF A01. Order Number DE84000942.

From 12. CAM-I annual meeting and technical conference; Dallas, TX, USA (8 Nov 1983).

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The full impact of CAD/CAM will not be felt until geometric modeling systems support dimensioning and tolerancing, have sophisticated user interfaces, and are capable of routinely handling many representation conversions. The attainment of these capabilities requires a joint effort among users, implementors, and theoreticians of geometric modeling.

4251 **(UCID—19919) EE/NESD computer-aided engineering FY '84 plan.** Merrill, R.D. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 20p. NTIS, PC A02/MF A01. Order Number DE84002145.

The NESD CAE FY84 plan is to expand facilities with a 400 MB disk storage, color graphics workstation, with graph tablet cursor control and companion copier and add a Division LSI-11/23 as a DECnet gateway node on the iCAEn etherway; expand CAE tools with TEX, DELIGHT, PICTURE, VAXIMA, a word processor, a VAX version of SOCKITTOME, and other applications, specific EE and software engineering CAE tools; and develop a CAE environment to provide the engineer with a user friendly computer interface.

4252 **(UCRL—88913) Approach to real-time holography.** Davidson, H.L.; Friedland, S.S. (Lawrence Livermore National Lab., CA (USA); Tel Aviv Univ. (Israel). Dept. of Physics). 15 Jul 1983. Contract W-7405-ENG-48. 7p. (CONF-830874—30). NTIS, PC A02/MF A01. Order Number DE84002779.

From 27. annual international technical symposium on high speed photography, videography and photonics; San Diego, CA, USA (21 Aug 1983).

Various diagnostic procedures in medicine, industry and defense produce 3-Dimensional data bases adequate to calculate a hologram. In most cases the nearer to real time the hologram can be produced the more beneficial. Since a hologram is a superposition of Fresnel zone plate patterns from each point source in the object volume on to the image plane a cellular array processor is suggested which will produce a factor of a million reduction in the time to calcuiate a hologram.

4253 **(UCRL—89894) Engineering work stations in the national laboratory.** O'Brien, D.W. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 3p. (CONF-831015—19). NTIS, PC A02/MF A01. Order Number DE84002459.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

The engineering workstation is characterized as a personal computer with sufficient computational capabilities and peripherals to support computer-aided engineering tools in a highly interactive way. The requirements for and significance of the engineering workstation are briefly summarized. (LEW)

4254 **(UCRL—89969) Some predictions on the performance of future supercomputers for simulation and control.** Davidson, H.L. (Lawrence Livermore National Lab., CA (USA)). 21 Oct 1983. Contract W-7405-ENG-48. 7p. (CONF-831015—18). NTIS, PC A02/MF A01. Order Number DE84002785.

From Nuclear science symposium; San Francisco, CA, USA (19 Oct 1983).

This talk will discuss what is meant by a supercomputer, some of the reasons why their performance is not as high as we would like, some techniques for improving this performance, and finally some predictions of how fast they will become in the near future, and what sorts of interesting and entertaining things we can do with these faster machines.

4255 **Numerical solution of initial/boundary-value problems in one space dimension.** White, A.B. Jr. (Los Alamos National Lab., NM). *SIAM (Society for Industrial and Applied Mathematics) Journal on Numerical Analysis;* **19**: No. 4, 683-697(Aug 1982).

The numerical solution of initial/boundary-value problems of the form A(u, x, t)u/sub t/ + B(u, x, t)u/sub x/ = c(u, x, t) is considered. Particular emphasis is placed on the solution of problems with large gradients, e.g., shocks and boundary layers. A mesh-selection technique is described that accurately places points in regions where the solution is rapidly changing. This is accomplished by a transformation of the original equations to a new coordinate system. Finite difference solutions for two sample problems are calculated.

4256 **Optimal parameters for linear second-degree stationary iterative methods.** Manteuffel, T.A. (Sandia National Labs., Albuquerque, NM). *SIAM (Society for Industrial and Applied Mathematics) Journal on Numerical Analysis;* **19**: No. 4, 833-839(Aug 1982).

In this paper we show that the optimal parameters for linear second-degree stationary iterative methods applied to nonsymmetric linear systems can be found by solving the same minimax problem used to find optimal parameters for the Chebyshev iteration. In fact, the Chebyshev iteration is asymptotically equivalent to a linear second-degree stationary method. The method of finding optimal parameters for the Chebyshev iteration given in Manteuffel [Numer. Math., 28 (1977), pp. 307-327] can be used to find optimal parameters for the stationary method as well.

4257 **Parametric integer linear programming: a synthesis of branch and bound with cutting planes.** Rountree, S.L.K. (Sandia National Labs., Albuquerque, NM); Gillett, B.E. *European Journal of Operational Research;* **10**: 183-189(1982).

A branch and bound algorithm is designed to solve the general integer linear programming problem with parametric right-hand sides. The right-hand sides have the form $b + \theta d$ where b and d are conformable vectors, d consists of nonnegative constants, and $\theta$ varies from zero to one. The method consists of first determining all possible right-hand side integer constants and appending this set of integer constants to the initial tableau to form an expanded problem with a finite number of family members. The implicit enumeration method gives a lower bound on the integer solutions. The branch and bound method is used with fathoming tests which allow one family member possibly to fathom other family members. A cutting plane option applies a finite number of cuts to each node before branching. In addition, the cutting plane method is invoked

whenever some members are feasible at a node and others are infeasible. The branching and cutting process is repeated until the entire family of problems has been solved.

4258 **Properties of estimators for the gamma distribution.** Bowman, K.O. (Union Carbide Corp., Oak Ridge, TN); Shenton, L.R. *Communications in Statistics. Part B: Simulation and Computation;* **11**: No. 4, 377-519(1982). Contract W-7405-ENG-26.

Accurate moments of maximum likelihood and moment estimators for the scale and shape parameters of a two parameter gamma density are given, the former being tabulated over a segment of the parameter space. In addition, joint acceptance regions are given for a particular case. The three parameter model is also considered and comments made on second order asymptotics for the maximum likelihood estimators.

4259 **Accuracy functions for confidence bounds: a basis for sample size determination.** Poggio, E.C. Berkeley, CA; Univ. of California (1979). 132p. University Microfilms Order No. 80-00,481.

Thesis (Ph. D.).

In many applications of statistics, a one-sided confidence bound provides the desired form of inference. In designing experiments or choosing data to be collected for such applications, there is no standard basis currently offered in the literature for determining sample sizes. This thesis attempts to provide such a basis. Suppose X is a random vector with distribution P/sub $\theta$, nu/, where $\theta$ is a real parameter and the parameter of interest and nu is a nuisance parameter. Suppose $\theta$(X) and anti $\theta$(X) are, respectively, (1-$\alpha$)-lower and -upper confidence bounds for $\theta$. The absolute accuracy functions for the lower and upper confidence bounds are defined, respectively, by P/sub $\theta$, nu/ [anti $\theta$-c$<\theta$t and P/sub $\theta$, nu/-[anti $\theta$(X) $< \theta + c$] for $c > 0$; and relative accuracy functions, by P/sub $\theta$, nu/[$\theta$-c $\theta < \theta$ (X)] for c belongs to (0,1) and $\theta > 0$ and P/sub anti $\theta$, nu/[$\theta$ (X) $< \theta + c\theta$] for $c > 0$ and $\theta > 0$. It is proposed that the size of a sample on which a confidence bound is to be computed may, in many instances, be appropriately based on the criterion that a selected accuracy function be at least of size $\beta$ where $\beta$ belongs to ($\alpha$,1). In some applications, it is possible to find a sample size satisfying the selected criterion for all possible values of $\theta$ and nu; in others, it is possible to satisfy it only for a restricted range of values. The accuracy functions are investigated in several settings. In the one- and two-sample location and scale problem, the accuracy functions are found to be constant or monotonic under natural invariance assumptions on the confidence bounds.

## 9903 Information Handling

*REFER ALSO TO CITATION(S) 3202*

4260 **(LA-UR—83-2979) Processing time using Datatrieve-11, clunks, and FORTRAN.** Horning, R.R.; Goode, W.E. (Los Alamos National Lab., NM (USA); Digital Equipment Corp., Los Alamos, NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-8310182—1). NTIS MF A01. Order Number DE84001706.

From US fall DECUS symposium; Las Vegas, NV, USA (24 Oct 1983).

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Although Datatrieve-11 processes dates with 100-ns resolution using clunks, it has no provision for processing time. This paper describes a set of Datatrieve-11 procedures and FORTRAN-callable subroutines for handling time, as well as dates, expressed in clunks. Although the FORTRAN-callable subroutines use RMS modules, these modules can be extracted from the appropriate RMS library, allowing FORTRAN programs to be linked to an FCS library instead of to RMS.

4261 **(LA-UR—83-2980) Multidomain, multirecord-type Datatrieve-11 databases.** Horning, R.R. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-8310182—3). NTIS MF A01. Order Number DE84001707.

From US fall DECUS symposium; Las Vegas, NV, USA (24 Oct 1983).

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Data bases consisting of multiple domains and multirecord-type domains present special problems in design, loading, maintenance, and report generation. The logical association of records is a fundamental concern in all these problem areas. This paper describes techniques for dealing with this and other specifics using Datatrieve-11, Sort-11, FORTRAN 77, and the RSX-11M Indirect Command File Processor.

4262 **(N—8325025) Energy. A continuing bibliography with indexes, issue 36, January 1983.** (National Aeronautics and Space Administration, Washington, DC (USA)). Jan 1983. 326p. (NASA-SP—7043(36)). NTIS, PC $15.00.

This bibliography lists 1297 reports, articles, and other documents introduced into the NASA scientific and technical information system from October 1, 1982 through December 31, 1982.

4263 **(PNL-SA—11539) Research topics in statistical database management.** Denning, D.; Nicholson, W.; Sande, B.; Shoshani, A. (SRI International, Menlo Park, CA (USA); Pacific Northwest Lab., Richland, WA (USA); Statistics Canada, Ottawa, Ontario; Lawrence Berkeley Lab., CA (USA)). Sep 1983. Contract AC06-76RL01830. 11p. (CONF-830950—3). NTIS, PC A02/MF A01. Order Number DE84002581.

From 2. international statistical database management workshop; Los Altos, CA, USA (27 Sep 1983).

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This report identifies research topics in statistical database management. These topics are grouped into four major areas: characteristics of statistical databases, functionality/usage, metadata, and logical models.

4264 **Toxicology data bank steps up efforts.** Seltzer, R. (C and EN, Washington). *Chemical and Engineering News;* **60**: 33-35(18 Oct 1982).

The National Library of Medicine (NLM) of the National Institutes of Health has gathered large amounts of data on known and potential toxicants in a central repository in an accessible and conveniently usable form. The result--now covering 3030 chemicals, with another 1030 being processed for inclusion--is the Toxicology Data Bank (TDB). A data base of 5000 to 6000 chemicals is envisioned eventually. TDB is a user-oriented, on-line, interactive computer-based data file and is the only peer-reviewed public data base giving general toxicology information on chemicals. The data are compiled at Oak Ridge National Laboratory. (JMT)

## 9904 Law

4265 **(INIS-mf—8604) Radiation Protection and Control Act 1982. No. 49 of 1982.** (State of South Australia). 29 Apr 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704415.

This Act provides for radiation protection in the State of South Australia. It controls activities related to radioactive substances and irradiating apparatus and lays down a licensing system to this effect. The South Australia Health Commission is responsible for administering the Act and is advised by the Radiation Protection Committee created for this purpose. The powers and duties of both bodies are set out in detail. (NEA).

4266 **(INIS-mf—8607) Radiation Safety Act 1975 - No. 44 of 1975.** (Western Australia). 18 Sep 1975. 46p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704416.

This Act regulates the use of radioactive substances and irradiating apparatus, including particle accelerators as well as certain specified electronic products. The Act lays down a licensing and registration system for such substances and apparatus; it sets up a Radiological Council to administer the Act and to advise the Minister responsible for public health on matters of radiation safety. The

radioactive Substances Act 1954 and the Amending Acts of 1960 and 1964 are repealed. (NEA).

4267 **(INIS-mf—8610) Radiation (Safety Control) Ordinance 1978.** (Northern Territory of Australia). 23 Aug 1978. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704418.

This Ordinance provides for the control, regulation, possession, use and transport of radioactive substance and irradiating apparatus. The Director of Health is responsible for administration of the Ordinance, which contains detailed provisions concerning the terms and conditions of licences, duties of licensees, medical examinations, maximum radiation doses, precautions to be taken to avoid exceeding such doses. The Ordinance also lays down a system of record-keeping and registration as well as packaging specifications for the transport of radioactive substances. (NEA).

4268 **(INIS-mf—8612) Order No. 571 of 7 December 1981 on apparatus used for X-ray analysis.** (Denmark). 18 Dec 1981. 18p. (In Danish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704419.

Published in the Danish Official Gazette Part A No. 87.

This Order was made under Order No. 56 of 17 February 1977 on the use of X-ray installations etc., which prescribes that safety measures must be taken to ensure radiation protection on the basis of the recommendations of the International Commission on Radiological Protection (ICRP). The Order also implements at national level the Directive of the Council of the European Communities of 15 July 1980 amending the previous Directives laying down basic safety standards for protection against ionizing radiation. This Order came into force on 1 January 1982. (NEA).

4269 **(INIS-mf—8614) 26183 - Royal Decree 2519/1982 of 12 August approving the Regulations on Protection Against Ionizing Radiation.** (Spain). 8 Oct 1981. 49p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704420.

Published in Spanish Official Gazette No. 241.

This Royal Decree approves the Regulations on Protection against Ionizing Radiation. The purpose of the Regulations is to implement the radiation protection principles laid down in the framework Act on Nuclear Energy of 29th April 1964, as amended. They supersede all existing national rules in the same field and contain administrative and technical provisions governing nuclear and radioactive installations and activities, including the use of radiation-emitting equipment. They were made in compliance with the most recent international regulations on radiation protection and safety, in particular the Recommendations of the International Atomic Energy Agency (IAEA); the Regulations also take into account the recent Euratom Directives. (NEA).

4270 **(INIS-mf—8615) Royal Decree 1157/1982 of 30 April approving the Statute of the Nuclear Safety Council.** (Spain). 7 Jun 1982. 6p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704427.

Published in the Spanish Official Gazette (No. 135).

This Decree, made in implementation of the Act of 1980, setting up the Nuclear Safety Council, lays down the statutes, responsibilities, structure and rules of procedure of the Council as well as its staff rules. (NEA).

4271 **(INIS-mf—8621) Decree No. 524 of 8 June 1982 of the President of the Republic implementing CEC. Directive No. 77/576 for standardization of Member States' legislative, regulatory and administrative provisions on safety signs in workplaces and CEC Directive No. 79/640 amending the Annexes of the latter.** (Italy). 10 Aug 1982. 3p. (In Italian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83704421.

Published in Italian Official Gazette No 218.

This Decree implements at national level Directive No 77/576 of 27 July 1977 of the Commission of the European Communities, as amended by Directive No 79/640 of 21 June 1979. The Directive provides for the standardization by Member States of their legislative, regulatory and administrative provisions concerning safety signs in workplaces, including radioactivity symbols. (NEA).

4272 **(INIS-mf—8624) Stb No. 501 - Decree of 24 June 1981 to amend the Radioactive Materials Decree made under the Nuclear Energy Act.** (The Netherlands). 1981. 18p. (In Dutch). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704422.

Published in the Netherlands Bulletin of Acts, Orders and Decrees.

This Decree incorporates in the Radioactive Materials Decree (Stb No. 404, 1969) certain provisions of the 1963 Ionizing Radiation (Safety) Decree as well as certain rules in the 1964 Mining Regulations concerning radioactive materials. It furthermore embodies in the national legislation the Euratom revised basic radiation protection standards of 1 June 1976, as amended on 27 March 1979. The 1963 Ionizing Radiation (Safety) Decree was repealed by Decree of 12 October 1981. (NEA).

4273 **(INIS-mf—8625) Stb No. 502 - Decree of 24 June 1981 to amend the Devices Decree made under the Nuclear Energy Act.** (The Netherlands). 1981. 14p. (In Dutch). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704423.

Published in the Bulletin of Acts, Orders and Decrees.

This Decree incorporates in the Devices Decree (Stb No 406 1969) certain provisions of the 1963 Ionizing Radiation (Safety) Decree as well as certain rules in the 1964 Mining Regulations concerning radiation emitting equipment and mining and drilling activities. It furthermore embodies in the national legislation the Euratom revised basic radiation protection standards of 1 June 1976, as amended on 27 March 1979. The 1963 Ionizing Radiation (Safety) Decree was repealed by Decree of 12 October 1981. (NEA).

4274 **(INIS-mf—8629) Act No. 2690 concerning the Turkish Atomic Energy Association.** (Turkey). 13 Jul 1982. 7p. (In Turkish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83704429.

Published in the Turkish Official Gazette.

The purpose of this Act is to reorganise the Turkish Atomic Energy Commission (TAEC) into an Association (TAEA) in order to provide it with greater powers. While remaining under the direct supervision of the Prime Minister, the TAEA how has legal personality, with more independence and flexibility from the financial and administrative viewpoints. (NEA).

4275 **Legal regime for the nuclear electricity-generating policy in France.** Baleynaud, P. Poitiers, France; Poitiers University (1982). 1165p. (In French). University of Poitiers, France.

The purpose of this thesis is to analyse the whole of the legal regime applicable to the national nuclear electricity generating policy, also with reference to comparative law. The connection between law and a novel technique is high-lighted and on this occasion, an assessment is made concerning the texts of ordinary law which govern other energies with a view to finding out whether they are adequate or whether legislation and regulations specific to the nuclear field have to be established. This approach to the nuclear problem is all the more interesting since the siting of power plants gives rise to reservations and opposition by the population and that the atom is at the heart of present concerns in connection with environmental protection.

4276 **Thirty-first to thirty-third annual report on the work of the Institut fuer Voelkerrecht at the Universitaet Goettingen. 1 April 1979 to 31 December 1981.** Goettingen, Germany, F.R.; Goettingen Universitaet ([nd]). 68p. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

The four departments of the Institute are the following: (1) Basic international law, (2) International commercial law, (3) Law of the European Community, (4) Atom energy law. Among others, they are also concerned with international environmental protection laws. The basis of the multi-facet research that is supported by the atomic energy law division is the collection of all atomic energy law documents, which were compiled in 1955 and are continuously updated. Questions of international law concerning nuclear weapons, or the problems created by the disposal of radioactive wastes

fall under this heading also. The annual reports include subjects that were discussed at seminars held during the 1979 Sommer semester, in dissertations, and in publications by the Institute and its W-workers. The reports also include a list of scientific co-operative projects. (orig./HSCH).

## 9905 Civilian Defense

4277 **(ORNL—5957) Hazard-mitigation potential of earth-sheltered residences. Final report, 1982-1983.** Chester, C.V.; Shapira, H.B.; Cristy, G.A.; Schweitzer, M.; Carnes, S.A.; Torri-Safdi, D. (Oak Ridge National Lab., TN (USA)). Nov 1983. Contract W-7405-ENG-26. 218p. NTIS, PC A10/MF A01. Order Number DE84002979.

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This report contains a review of the literature on earth-sheltered housing (ESH), an analysis of the protection potention against natural and technological hazards, cost comparison with conventional construction, and example design, and a discussion of institutional issues and policy options affecting the adoption of ESH. 70 references, 12 figures, 11 tables.

# CORPORATE AUTHOR INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the document title and the volume and abstract numbers. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German; are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes.

DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

## A


**Acurex Corp., Mountain View, CA (USA)**
Linear Fresnel lens photovoltaic concentrator program, 9:2125 (R;US)

**Advanced Fuel Research, Inc., East Hartford, CT (USA)**
Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83, 9:1793 (R;US)

**Aerospace Corp., Germantown, MD (USA)**
Assessment of energy storage for solar applications, 9:2151 (R;US)

**Aerospace Corp., Los Angeles, CA (USA). Electronics Research Lab.**
FIR laser-development program. Final report, 9:4047 (R;US)

**Air Force Engineering and Services Center, Tyndall AFB, FL (USA)**
The use of fuel additives to control plume opacity of turbine engine test cells. Final report Mar 78-Oct 81, 9:1868 (R;US)

**Air Force Geophysics Lab., Hanscom AFB, MA (USA)**
Using solar radio burst integrated fluxes to predict energetic proton flux increases, 9:3460 (R;US)

**Air War Coll., Maxwell AFB, AL (USA)**
High altitude radiation exposure in the SR-71: a preliminary report. Professional study, 9:3390 (R;US)

**Alabama Univ., University (USA). Dept. of Mechanical Engineering**
Demonstration and evaluation of plastic bag streamlining on highway trucks for drag reduction and energy savings. Final report, 9:2637 (R;US)

**Allied Chemical Co., Solvay, NY (USA). Syracuse Research Lab.**
Study to establish cost projections for production of redox chemicals, 9:2525 (R;US)

**American Magnetics, Inc., Oak Ridge, TN**
Wide-range vortex shedding flowmeter for high-temperature helium gas, 9:2282 (R;US)

**Ames Lab., IA (USA)**
Formulae for configuration averages of products of one-body and two-body operators in many-fermion spaces, 9:4017 (R;US)
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2096 (R;US)
Review of progress in quantitative NDE, 9:3097 (R;US)

**AN SSSR, Moscow**
Gamma-gun in the center of the galaxy, 9:3472 (R;SU)

**AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.**
Diffusion decay of binary precipitation in "transitional" asymptotic range, 9:2709 (R;SU;In Russian)
Far infrared heterodyne laser interferometer, 9:4076 (R;SU;In Russian)

**AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki**
Fluctuation and radiation processes in bounded plasma-molecular systems, 9:4075 (R;SU;In Russian)

**Applicazioni e Ricerche Scientifiche, Milan (Italy)**
Econometric estimates of the EDM model (Italian version of Frankfurt and Cambridge model), 9:2555 (R;XE)

**Argonne National Lab., IL (USA)**
Assessment of cool storage in commercial building applications, 9:2620 (R;US)
Beam profile monitor systems for the 180 MeV stage of MAMI, 9:3145 (TG;US)
CP/MAS $^{13}C$ NMR spectroscopic study of chlorophyll a in the solid state, 9:3351 (R;US)
Fully coupled calculation of fluid flows with limited use of computer storage, 9:3603 (R;US)
Measurement of the thermal diffusivity of molten $UO_2$, 9:2471 (TG;US)
Metal-hydride heat-pump performance studies, 9:2619 (R;US)
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3777 (R;US)
Proceedings of the international meeting on development, fabrication and application of reduced enrichment fuels for research and test reactors, 9:2352 (R;US)
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2406 (R;US)

**Arizona State Univ., Tempe (USA)**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3914 (R;US)

**Arizona Univ., Tucson (USA)**
Applications of hybrid numerical-simulation methods to magnetic-confinement systems, 9:4052 (R;US)
Artifically layered superconductors. Annual progress report, 9:2683 (R;US)

**Arizona Univ., Tucson (USA). Dept. of Hydrology and Water Resources**
Stable isotopic investigation of the ground water quality and transport systems in the Safford Valley, Arizona. Report for Oct 80-Sep 81, 9:2160 (R;US)

**Army Construction Engineering Research Lab., Champaign, IL (USA)**
Addition of coal mining regulations to the Computer-Aided Environmental Legislative Data System (CELDS). Final report, 9:1818 (R;US)

**Army Engineer Waterways Experiment Station, Vicksburg, MS (USA). Structures Lab.**
Studies of the constitution of fly ash using selective dissolution. Final report, 9:1796 (R;US)

**Ashland Synthetic Fuels, Inc., KY (USA)**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1760 (R;US)
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1759 (R;US)
Materials evaluation at the H-Coal Pilot Plant, 9:1761 (R;US)

**Aspen Technology, Inc., Cambridge, MA (USA)**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1767 (R;US)

**Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee**
Computation code for the energy deposition calculation of a resonant wave near the electron cyclotron frequency, 9:4055 (R;FR;In French)
Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4057 (R;FR;In French)
Magnetic islands and turbulence, 9:4056 (R;FR;In French)

**Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Groupe de Recherches sur la Fusion Controlee**
Production of negative D⁻ ions by double charge exchange using cesium, 9:4231 (TG;US)
**Astronomische Gesellschaft, Hamburg (Germany, F.R.)**
Activity in the centers of galaxies, 9:3496 (BA;DE)
**Atlantic Research Corp., Alexandria, VA (USA)**
Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981, 9:3114 (R;US)
Development and evaluation of coal-water mixture combustion technology. Phase I. Second quarterly report, 11 January 1981-10 April 1981, 9:3115 (R;US)
**Atmospheric Science Associates, Bedford, MA (USA)**
DNAF-1: an analytical fallout prediction model and code. Final report 12 Mar 80-31 Oct 81, 9:3231 (R;US)
**Auburn Univ., AL (USA)**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1769 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1771 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1770 (R;US)
**Auburn Univ., AL (USA). Coal Conversion Lab.**
Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1762 (R;US)
**Australian National Univ., Canberra. Dept. of Nuclear Physics**
Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3513 (R;AU)
**Avco-Everett Research Lab., Everett, MA (USA)**
MHD-generator component development. Quarterly report, July 1981-September 1981, 9:2580 (R;US)
MHD-generator component development. Quarterly report, October 1981-December 1981, 9:2581 (R;US)
MHD-generator component development. Quarterly report, July 1982-September 1982, 9:2584 (R;US)
MHD-generator component development. Quarterly report, January 1982-March 1982, 9:2582 (R;US)
MHD-generator component development. Quarterly report, April 1983-June 1983, 9:2587 (R;US)
MHD-generator component development. Quarterly report, October 1982-December 1982, 9:2585 (R;US)
**Avco-Everett Research Lab., Inc., Everett, MA (USA)**
MHD-generator component development. Quarterly report, April 1982-June 1982, 9:2583 (R;US)
MHD-generator component development. Quarterly report, January 1983-March 1983, 9:2586 (R;US)

## B

**Babcock and Wilcox Co., Alliance, OH (USA). Contract Research Div.**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2223 (R;US)
**Babcock and Wilcox Co., Lynchburg, VA (USA)**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2223 (R;US)
**Babcock and Wilcox Co., Lynchburg, VA (USA). Utility Power Generation Div.**
Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2222 (R;US)
**Badenwerk A.G., Karlsruhe (Germany, F.R.)**
Badenwerk - annual report 1982, 9:2574 (R;DE;In German)
**Battelle Columbus Labs., OH (USA)**
State-of-the-art survey of existing knowledge for the design of ground-source heat pumps, 9:2629 (R;US)
Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82, 9:1859 (R;US)
**Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)**
State-of-the-art survey of existing knowledge for the design of ground-source heat pumps, 9:2629 (R;US)
System study on the development of a core catcher concept for light water reactors. Final report/main volume, 9:2435 (R;DE;In German)
Systems study for development of a core catcher for LWR-type reactors. Final report/materials, 9:2417 (R;DE;In German)
**Battelle Pacific Northwest Labs., Richland, WA (USA)**
Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)
**Bayreuth Univ. (Germany, F.R.). Abt. fuer Meteorologie am Lehrstuhl fuer Hydrologie**
Circumsolar sky radiation: the flux density of radiation energy originating from the circumsolar sky measured at groundbased stations. Final report, 9:2101 (R;XE)
**BDM Corp., Albuquerque, NM (USA)**
Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report, 9:2176 (R;US)
**Bedrosian and Associates, Alpine, NJ (USA)**
Method of preserving fruits and vegetables. Final report, 9:2644 (R;US)
**Besancon Univ., 25 (France)**
Temporal functional analysis of dynamic scintigraphy by application of the Karhunen-Loeve transform, 9:3357 (R;FR;In French)
**Bolt, Beranek and Newman, Inc., Arlington, VA (USA)**
Technical assistance for Project Conserve. Final report, 9:2597 (R;US)
**Bolt, Beranek and Newman, Inc., Cambridge, MA (USA)**
Demonstrating the noise control of a coal preparation plant. Volume 2: long term treatment evaluation. Open file report Oct 77-Aug 81, 9:1812 (R;US)
**Bonner and Moore Management Science, Houston, TX (USA)**
Impacts of alcohol fuels on the US refining industry, 9:2647 (R;US)
**Boston Coll., Chestnut Hill, MA (USA). Dept. of Chemistry**
Chemiluminescence and laser induced fluorescence of boron atom reactions. Final progress report, 9:2912 (R;US)
**Brandeis Univ., Waltham, MA (USA). Dept. of Physics**
Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3514 (R;US)
**Braun (C.F.) and Co., Alhambra, CA (USA)**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1776 (R;US)
**British Carbonization Research Association, Chesterfield**
Moisture determination by microwave heating, 9:1794 (R;US)
**British Columbia Univ., Vancouver (Canada). TRIUMF Facility**
Symmetries and the N-N interaction, 9:3820 (R;CA)
**Brookhaven National Lab., Upton, NY (USA)**
Area group: an example of style and paste compositional covariation in Maya pottery, 9:4237 (R;US)
Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen, 9:2756 (TG;US)
Compositional attribution of non-provenienced Maya polychrome vessels, 9:2889 (R;US)
Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3514 (R;US)
History and ritual events on a Petexbatun Classic Maya polychrome vessel, 9:4236 (R;US)
Identification of cost factors for the ocean disposal alternative for low-level radioactive waste, 9:2001 (R;US)
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water, 9:2221 (R;US)
MWPC data acquisition in the Brookhaven FASTBUS, 9:3168 (R;US)
Neutron activation analyses: Teotihuacan trade ceramics, 9:2888 (R;US)
NRC plant-analyzer development at BNL, 9:2403 (R;US)
Proceedings of the forum on district heating for Long Island, 9:2660 (R;US)

Quark search at the CBA, 9:3616 (R;US)
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3905 (R;US)

**Brown Univ., Providence, RI (USA)**
Improvement in the design and extension of operating range of viscometers and thermal conductivity cells. Annual technical progress report, 9:3209 (R;US)

**Building Research Establishment, Watford (UK)**
Basic characteristics of low-cost houses in order to reduce the energy consumption for heating: efficiency of heating plants and controls. Final report, January 1978-September 1980, 9:2616 (R;XE)

**Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)**
Greece - energy situation 1981/82, 9:2557 (R;DE;In German)
Sri Lanka - energy situation 1981/82, 9:2556 (R;DE;In German)
Switzerland - energy situation 1981, 9:2558 (R;DE;In German)

**Bureau of Mines, Albany, OR (USA). Albany Research Center**
Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations, 9:3291 (R;US)

**Bureau of Mines, Boulder City, NV (USA). Boulder City Engineering Lab.**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1802 (R;US)

**Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center**
Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations, 9:1811 (R;US)

**Bureau of Mines, Spokane, WA (USA). Spokane Research Center**
Physical property data on coarse anthracite waste. Report of investigations, 9:1801 (R;US)

**Bureau of Mines, Tuscaloosa, AL (USA). Tuscaloosa Research Center**
Evaluation of radium and toxic element leaching characteristics of Florida phosphogypsum stockpiles. Report of investigations/1983, 9:3289 (R;US)

**Bureau of Reclamation, Denver, CO (USA). Engineering and Research Center**
Effects of operating the Mt. Elbert Pumped-Storage Powerplant on Twin Lakes, Colorado: 1981 report of findings. Technical report, 9:2100 (R;US)

## C

**California Inst. of Tech., Pasadena (USA)**
Energy Research Program. Final report, 1 September 1976-28 February 1982, 9:4238 (R;US)

**California Polytechnic State Univ., San Luis Obispo (USA)**
Solar industrial process heat (IPH) project. Technical report, October 1981-September 1982, 9:2146 (R;US)

**California Univ., Berkeley (USA)**
Accuracy functions for confidence bounds: a basis for sample size determination, 9:4259 (D;US)
Coherent conversion of the sunlight spectrum. Final Report, 28 July 1980-30 April 1982, 9:2116 (R;US)

**California Univ., Berkeley (USA). Dept. of Chemistry**
Fischer-Tropsch catalysis. Annual report 1 Jun 81-31 May 82, 9:2082 (R;US)

**California Univ., Los Angeles (USA)**
Alternate fusion-fuel-cycle plasma physics and reaction kinetics. Final report, 9:4154 (R;US)
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4050 (R;US)

**California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering**
Fusion reactors: physics and technology. Annual progress report, 9:4153 (R;US)
Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4046 (R;US)

**Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Metallurgy and Materials Science**
Effects of alloy composition and processing on the microstructure of D-9 type stainless steel. Final report, 9:2684 (R;US)

**Case Western Reserve Univ., Cleveland, OH (USA)**
Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983, 9:3392 (R;US)

**Case Western Reserve Univ., Cleveland, OH (USA). Case Center for Electrochemical Sciences**
Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983, 9:2529 (R;US)

**CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)**
Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment, 9:4147 (R;FR;In French)

**CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)**
Growth and physiology of an industrially useful macroalga (Chondrus crispus), analyzed by continuous measurement of gas exchange, 9:3384 (R;FR;In French)

**CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves, 9:2821 (R;FR;In French)
Low temperature irradiations of iridium and of the compound $Nb_3Ge$, 9:2678 (R;FR;In French)
Radiation effects on the reliabiliaty of microprocessors and associated circuits, 9:3207 (R;FR;In French)
Radiotherapy of acne - a literature survey, 9:3355 (R;FR;In French)

**CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. of Research on Plutonium Based Fuels**
Measurement of the thermal diffusivity of molten $UO_2$, 9:2471 (TG;US)

**CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)**
Detection limit of a signal in a background. Application to radioactivity measurements, 9:3169 (R;FR;In French)

**CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Lab. de Diffraction Neutronique**
Magnetic form factor measurements in cerium hexaboride, 9:2779 (R;US)

**CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)**
Boron carbide in pile behaviour Rapsodie experience, 9:2778 (R;FR)
Complex singularities and distribution of zeros in Ising and gauge models, 9:3825 (R;FR)
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3890 (R;FR;In French)
Demonstration of a large deformation in the first stage of the sequence reaction $^{12}C(^{28}Si,\alpha\alpha)^{32}S$(g.s.) by analysis of angular correlation measurements, 9:3889 (R;FR;In French)
Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions, 9:3738 (R;FR;In French)
Introduction to Feynman graph calculations, 9:3826 (R;FR;In French)
Lattice gauge theories with Susskind fermions at strong coupling. Analytical method and results, 9:3824 (R;FR)
Low temperature irradiation effects on iron-boron based amorphous metallic alloys, 9:2679 (R;FR;In French)
$^{20}Ne$ induced peripheral reaction at 30 MeV/nucleon, 9:3875 (R;FR)
Particular treatments in Eddy current technique. Application to the control of corrugated tubes, 9:3092 (R;FR;In French)
Physical properties of boron carbide, 9:2777 (R;FR)
Preparation of carbon 11-labelled radiopharmaceuticals by the use of HPLC method, 9:3356 (R;FR;In French)
Projectile break-up of $^{14}N$ at 62,7 MeV, 9:3876 (R;FR)
Projectile fragmentation and light particle emission from 70 MeV/nucleon $\alpha$ particles on $^{197}Au$, 9:3925 (R;FR)
Prospects in the study of very inelastic electronuclear reactions, 9:3737 (R;FR)
Solar desalination, 9:2140 (R;FR)
Sturm-Liouville spectrum problem: quartic oscillator case, 9:4002 (R;FR;In French)
Survey of C.E.A. absorber materials development program, 9:2280 (R;FR)
Wigner effect in graphite stack: G2 and G3 reactors, 9:2820 (R;FR;In French)

**CEA, 75 - Paris (France)**
Financial security and insurance for damage caused by use of the seabed for radioactive waste disposal, 9:1990 (R;FR;In French)

Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2517 (R;XE;FR)
**Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro**
Hadron phenomenology, 9:3761 (R;BR;In Portuguese)
**Centro Latino Americano de Fisica, Rio de Janeiro (Brazil)**
Proceedings of the 1. Latin-American Colloquium of Surface Physics, 9:3984 (R;BR;In Portuguese)
**Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Atividades Espaciais**
Decay of 399 KeV isomeric state in $^{197}$Pt. A possible candidate for PAC studies, 9:3926 (R;BR)
**CER Corp., Las Vegas, NV (USA)**
Tight gas sands evaluation and technology development. Final report Jan 79-Nov 82, 9:1895 (R;US)
**Chicago Univ., IL (USA)**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1772 (R;US)
**Cincinnati Univ., OH (USA). Dept. of Environmental Health**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3410 (R;US)
**City Coll., New York (USA)**
Development of wave forecasting methods. Final report, 9:2181 (R;US)
**Cleveland State Univ., OH (USA)**
A study of dynamic energy equations for Stirling cycle analysis. Final Report, 9:2673 (R;US)
**College of William and Mary, Williamsburg, VA (USA)**
Nonlinear magnetohydrodynamic. Summary of recent activity (Task I). Progress report, 9:4053 (R;US)
**College of William and Mary, Williamsburg, VA (USA). Dept. of Physics**
Negative-ion detachment cross sections. Progress report, March 1, 1983-February 28, 1984, 9:3516 (R;US)
**Colorado School of Mines, Golden (USA)**
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2680 (R;US)
Investigation of fracture permeability around an underground opening in metamorphic rocks, 9:3441 (R;US)
**Colorado School of Mines, Golden (USA). Excavation Engineering and Earth Mechanics Inst.**
Evaluation of mechanical excavation systems for oil-shale mining. Final technical report, 9:1907 (R;US)
**Colorado School of Mines, Golden (USA). Research Inst.**
Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82, 9:1896 (R;US)
**Colorado State Univ., Fort Collins (USA)**
Experiments with phase transitions at very high pressure. Final Report, 9:2831 (R;US)
**Colorado Univ., Boulder (USA)**
Time-dependent study of radiation trapping by time-delayed two-photon absorption, 9:3544 (R;US)
**Colorado Univ., Boulder (USA). Inst. of Behavioral Sciences**
Tenant-paid energy costs in multifamily rental housing: effects on energy use, owner investment, and the market value of energy, 9:2609 (R;US)
**Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory**
Climate-chemistry connection, 9:3263 (R;US)
**Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Direzione Centrale Studi dell'Energia Nucleare e delle Energie Alternative (ENEA)**
Analysis of medium-term economic development and energy consumptions through the EURECA-EXPLOR-EDM model chain. Final report, 9:2596 (R;XE)
**Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements**
1981 Annual status report. Nuclear measurements, 9:3863 (R;XE)
**Commission of the European Communities, Ispra (Italy). Joint Research Centre**
BAESNUM, a conversational computer program for the Bayesian estimation of a parameter by a numerical method, 9:4246 (R;XE)
Characterization of the Dirichlet distribution as prior, 9:4247 (R;XE)
Euracos activation experiments: preliminary uncertainty analysis, 9:2903 (R;US)
Finite element part of the LAMCAL program. Elastic-plastic fracture mechanics applications, 9:2676 (R;XE)
Optimization technique applied to interpretation of experimental data and research of constitutive laws, 9:2685 (R;XE)
**Commission of the European Communities, Luxembourg**
Community's research and development programme on decommissioning of nuclear power plants (year 1981). Annual progress report No. 2, 9:2448 (R;US)
Harmonization of methods for measurements of $SO_2$. Final report, 9:3270 (R;US)
High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium, 9:1955 (R;XE)
Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment, 9:2000 (R;US)
Investigation into hydrogen storage with cryoadsorbents and comparison of alternative hydrogen storage methods, 9:2074 (R;US)
Seismic mapping and geological prognosis for the geothermal prospects Farsoe, Nibe and Loegstoer: exploratory well and reservoir investigation Farsoe-1. Parts 1, 2, and 3, 9:2162 (R;US)
**Commission of the European Communities, Luxembourg. Center for Information and Documentation**
Acid digestion of Pu-containing waste. Process development and Pu-recovery, 9:1951 (R;XE;In German)
Fabrication, irradiation and post-irradiation examinations of $MO_2$ and $UO_2$ sphere-pac and $UO_2$ pellet fuel pins irradiated in a PWR loop, 9:2224 (R;XE)
Fabrication of high activity glasses in the cells VULCAIN and PIVER. Leaching at three temperatures of some of these glasses in the VULCAIN cell, 9:1952 (R;XE;In French)
Processing of irradiated fuel cans by rolling and embedding in concrete (Final report Nov 1976-Jul 1980), 9:1956 (R;XE;In German)
Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report, 9:2202 (R;XE;In French)
R and D program concerning radioactive waste disposal in deep geologic formation (Study of an argilaceous formation in Belgium). Summary of works carried out in the years 1975-1979, 9:1953 (R;XE;In French)
Solidification of alpha-bearing wastes in ceramic, 9:1954 (R;XE;In German)
Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings, 9:2203 (R;XE)
**Commission of the European Communities, Luxembourg. Directorate-General for Information, Market and Innovation**
Development of a 1 pKW photovoltaic concentrator system with silicon cells, 9:2137 (R;XE)
Integrated thin film solar cell generators with higher output voltages, 9:2109 (R;XE)
Ion implantation of glow discharge amorphous silicon and possible application to solar cell devices, 9:2110 (R;XE)
**Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center**
1981 Annual status report. High-temperature materials, 9:2686 (R;XE)
1981 Annual Status Report. Operation of the high flux reactor, 9:2381 (R;XE)
Annual report 1981. Joint Research Centre Petten Establishment, 9:2382 (R;XE)
**Committee on Appropriations (U.S. House), Washington, DC**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2560 (R;US)
**Compagnie Generale des Matieres Nucleaires (COGEMA), Centre de la Hague, 50 - Cherbourg (France)**
In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant, 9:3292 (R;FR;In French)
**Compagnie Generale des Matieres Nucleaires (COGEMA), Centre de Marcoule, 30 - Bagnols-sur-Ceze (France)**
Wigner effect in graphite stack: G2 and G3 reactors, 9:2820 (R;FR;In French)
**Cornell Univ., Ithaca, NY (USA). Center for Radiophysics and Space Research**
Studies related to the deep earth gas. Annual report Jan-Dec 82, 9:1877 (R;US)

**Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering**
Detection of the change in mean inner potential at dislocations in grain boundaries in NiO, 9:2780 (R;US)
Observation of the effect of solute segregation on grain boundary structure, 9:2682 (R;US)
**Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies**
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3777 (R;US)
**Cornell Univ., Ithaca, NY (USA). Ward Lab.**
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3905 (R;US)
**Council for Mineral Technology, Randburg (South Africa)**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2899 (R;ZA)
Atomic-absorption programme for the Apple 2 plus computer, 9:3213 (R;ZA)
Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2897 (R;ZA)
Determination, by x-ray-fluorescence spectrometry, of gold and uranium on resin, 9:2898 (R;ZA)
Installation and commissioning of a Siemens SRS200 sequential X-ray-fluorescence spectrometer, 9:3214 (R;ZA)
New robust method for the treatment of analytical data, 9:3212 (R;ZA)
Preparation and certification of a uranium reference material, 9:2900 (R;ZA)
Tracer tests on furnaces at Metalloys Limited, 9:3116 (R;ZA)
**Crystal Systems, Inc., Salem, MA (USA)**
Origin of SiC impurities in silicon crystals grown from the melt in vacuums, 9:2121 (R;US)
Part 2: Multi-wire slicing. Fixed Abrasive Slicing Technique (FAST), 9:2118 (R;US)
Part 1: Silicon ingot casting. Heat Exchanger Method (HEM), 9:2117 (R;US)
Silicon crystal growth in vacuum, 9:2120 (R;US)
Silicon slicing by fixed abrasive slicing technique, 9:2119 (R;US)
Single crystal growth of upgraded metallurgical silicon by HEM for photovoltaic applications, 9:2122 (R;US)
**Culver Military Academy, IN (USA)**
You have no right to make me think about this--the de-legitimation of current nuclear policies among key American elites, 9:2550 (R;US)
**Cummins Engine Co., Inc., Columbus, IN (USA)**
Cummins advanced turbocompound diesel engine evaluation, 9:2668 (R;US)
**Custom Engineering, Inc., Englewood, CO (USA)**
Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2182 (R;US)

## D

**Dame (Richard E.), Silver Spring, MD (USA)**
Line-focusing adjustable parabolic solar-concentrating collector. Final report, 9:2148 (R;US)
**DeBra (Fred B.) Co., Cincinnati, OH (USA)**
Services to operate and maintain a diesel exhaust exposure system for chronic animal inhalation exposure studies. Final report, 9:3419 (R;US)
**Delaware Univ., Newark (USA)**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1819 (R;US)
**Deminex-Deutsche Erdoelversorgungsgesellschaft m.b.H., Essen (Germany, F.R.)**
DEMINEX activities 1980, 9:2564 (R;DE;In German)
**Department of Commerce, Washington, DC (USA)**
Energy and economic development: a practical guide for the 1980's, 9:2595 (R;US)
**Department of Energy, Las Vegas, NV (USA). Nevada Operations Office**
Annotated bibliography of cultural resources literature for the Nevada Nuclear Waste Storage Investigations, 9:1995 (R;US)
Cultural resources overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:1994 (R;US)
**Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)**
Nuclear industry review. Problems and prospects 1981-2000, 9:2551 (R;CA)
**Department of Energy, Oak Ridge, TN (USA). Oak Ridge Operations Office**
Baseline assessment of the Strategic Petroleum Reserve Project Management Office, 9:1869 (R;US)
**Department of Energy, Washington, DC (USA)**
Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor, 9:1989 (R;FR)
**Department of Energy, Washington, DC (USA). Office of Industrial Programs**
Catalytic distillation: a government-industry success story, 9:2649 (R;US)
**Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences**
Argon analytical procedures for potassium-argon dating, 9:3434 (R;NZ)
Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2894 (R;NZ)
Falls Dam, Otago, sedimentation rate measured by the caesium-137 profile, 9:3435 (R;NZ)
Geothermal remnant activity at Ngawha 1981, 9:2157 (R;NZ)
Ngawha track etch survey 1981. Preliminary results, 9:2166 (R;NZ)
Radioactive tracers in geothermal underground water flow studies, 9:2158 (R;NZ)
Stable Isotope Group 1981 progress report, 9:2165 (R;NZ)
**Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)**
Gluon fragmentation in T(1S) decays, 9:3626 (R;DE)
Inclusive production of electrons and muons in multihadronic events at PETRA, 9:3625 (R;DE)
Recent results from Jade on electroweak interactions, 9:3627 (R;DE)
Simulation of electron spin depolarisation with the computer code SITROS, 9:3137 (R;DE)
Transverse beam cavity interaction. Pt. 2, 9:3136 (R;DE)
**Digital Equipment Corp., Los Alamos, NM (USA)**
Processing time using Datatrieve-11, clunks, and FORTRAN, 9:4260 (R;US)
**Dortmund Univ. (Germany, F.R.)**
Investigations of the mechanical behavior of spot welded joints by means of acoustic emission analysis, 9:3103 (TG;US)
**Dortmund Univ. (Germany, F.R.). Abt. Chemie**
Catalytic-kinetic micro trace determination of fluoride in environmental matrixes, 9:2902 (R;DE;In German)
**Duesseldorf Univ. (Germany, F.R.). Medizinische Fakultaet**
Therapeutic effects of radiotherapy of carcinoma of corpus uteri and cervix in the years 1967-1972, 9:3361 (R;DE;In German)
**Duke Power Co., Charlotte, NC (USA)**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2223 (R;US)
**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**
Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models, 9:3265 (R;US)
High-level waste description, inventory and hazard, 9:1948 (R;US)
Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2891 (R;US)
Technical bases for offsite emergency planning at SRP, 9:2407 (R;US)
Thermal-effects study, 9:2348 (R;US)

## E

**Earth Technology Corp., Houston, TX (USA)**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report, 9:1828 (R;US)

**ECO, Inc., Cambridge, MA (USA)**
Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82, 9:1809 (R;US)

**Ecological Analysts, Inc., Sparks, MD (USA)**
Survey of water quality and flow in Maryland coastal zone streams: a data report. Final report, 9:3343 (R;US)

**ECON, Inc., Princeton, NJ (USA)**
Methods of economic analysis applied to fusion research. Final report, 9:4155 (R;US)

**Ecoview, Napa, CA (USA)**
Direct-heat applications of geothermal energy in The Geysers/Clear Lake region. Volume II. Environmental assessment. Final report, 9:2168 (R;US)

**EG and G Idaho, Inc., Idaho Falls (USA)**
Alcohol-Fuel-Technology Grant Program: an evaluation and summary, 9:2089 (R;US)
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2411 (R;US)
Catalytic distillation: a government-industry success story, 9:2649 (R;US)
Comparisons of the SCDAP computer code with bundle data under severe accident conditions, 9:2410 (R;US)
Description and operation of Haakon School geothermal-heating system, 9:2180 (R;US)
Economics of low-level radioactive waste disposal, 9:1950 (R;US)
Evaluation of direct-use-project drilling costs, 9:2171 (R;US)
Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4, 9:2445 (R;US)
Feasibility study on feed and bleed for pressurized-water reactors, 9:2409 (R;US)
Final report on PE-II activities from August 1981-September 1983, 9:4158 (R;US)
Interim results of the accident sequence evaluation program (ASEP), 9:2457 (R;US)
One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program, 9:2412 (R;US)
Pumps-as-turbines experience profile, 9:2192 (R;US)
Raft River 5MW(e) binary geothermal-electric power plant: operation and performance, 9:2169 (R;US)
Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility, 9:2408 (R;US)
Selecting host states for low-level waste-disposal sites, 9:1949 (R;US)
Severe fuel-damage scoping test performance, 9:2405 (R;US)

**Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik**
Superconducting ground state of a strongly interacting electron system: $UBe_{13}$, 9:2711 (R;US)

**Elektrisitetsforsyningens Forskningsinstitutt, Trondheim-NTH (Norway)**
Digital substation control systems in the electricity supply. System description, 9:2197 (R;NO;In Norwegian)
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2576 (R;NO;In Norwegian)

**Emmanuel Coll., Boston, MA (USA)**
Geomagnetic pulsations-production/interpretation. Final scientific report 1 Sep 78-30 Sep 81, 9:3503 (R;US)

**Energotechnology Corp., Cambridge, MA (USA)**
Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach, 9:2190 (R;US)

**Energy Management Centre, New York (USA)**
Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies, 9:4241 (R;XE)

**Ente Nazionale per l'Energia Elettrica, Pisa (Italy). National Geothermal Unit**
Community demonstration project: geothermal pair of wells at Latera. Final drilling report, 9:2163 (R;XE;In English and Italian)
Community demonstration project: geothermal wells at Cesano. Final drilling report, 9:2164 (R;XE;In English and Italian)

**Environmental and Chemical Sciences, Inc., Aiken, SC (USA)**
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3342 (R;US)

**Environmental Protection Agency, Ann Arbor, MI (USA)**
Derivation of I/M benefits for pre-1981 light duty vehicles for low altitude, non-California areas, 9:2675 (R;US)

**Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Monitoring and Systems Lab.**
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3281 (R;US)

**Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Sciences Research Lab.**
Source apportionment methods applied to the determination of the origin of ambient aerosols that affect visibility in forested areas, 9:3271 (R;US)

**Environmental Protection Agency, Research Triangle Park, NC (USA). Industrial Environmental Research Lab.**
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1804 (R;US)
Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1805 (R;US)

**Erevanskij Fizicheskij Inst. (USSR)**
Discrete symmetries in SO(N) grand unified groups and the survival hypothesis, 9:3795 (R;SU)
Fine structure in the orientational dependence of the total yield of superfast electrons from a diamond crystal, 9:2822 (R;SU;In Russian)
Inclusive spectra of hadrons in photon-nucleus collisions, 9:3742 (R;SU)
Origin of low energy antiprotons in cosmic rays, 9:3449 (R;SU)
Phenomenon of the minimum of radiation energy losses of relativistic electrons in the crystal, 9:3965 (R;SU;In Russian)
Reggeon field theory at $D = 2$ in two-loop approximation, 9:3744 (R;SU)
Renormalizability of reggeon field theory with account of thresholds and mass terms at $D = 2$, 9:3743 (R;SU)

**Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik**
Investigation of lattice defects in zinc after proton and electron irradiation, 9:2705 (R;DE;In German)
Spectroscopy of the neutrons from the decay of the giant quadrupole resonance region in $^{208}$Pb, 9:3927 (R;DE;In German)

**Exide Management and Technology Co., Yardley, PA (USA)**
Report for 1981 on research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion, 9:2528 (R;US)

**Exxon Nuclear Co., Inc., Richland, WA (USA)**
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2201 (R;US)

**Exxon Research and Engineering Co., Linden, NJ (USA). Corporate Research Science Lab.**
Electron-electron interactions and broken symmetry in one dimension, 9:3541 (R;US)

## F

**Florida Atlantic Univ., Boca Raton (USA). Center for Energy Conservation**
Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report, 9:2624 (R;US)

**Florida Public Service Commission, Tallahassee (USA)**
Residential conservation demonstration program. Final report, 9:2622 (R;US)

**Florida State Univ., Tallahassee (USA). Dept. of Physics**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3904 (R;US)

**FluiDyne Engineering Corp., Minneapolis, MN (USA)**
MHD air heater technology development. Technical progress report, October 1, 1982-September 30, 1983, 9:2579 (R;US)

**Fluor Engineers and Constructors, Inc., Irvine, CA (USA)**
Assessment of discharges from Sasol I Lurgi-based coal gasification plant. Final report Sep 81-Mar 82, 9:1806 (R;US)
**Foersvarets Forskningsanstalt, Umea (Sweden)**
Effect of cadmium on transmitter transportation, 9:3411 (R;SE;In Swedish)
**Food and Agriculture Organization of the United Nations, Rome (Italy)**
Isotope and radiation applications to agricultural development in Asia and the Pacific Region. Speech given during the seminar, 9:3389 (R;MY)
**Forest Products Lab., Madison, WI (USA)**
Survey completion report: residential fuelwood use in the United States: 1980-81, 9:2093 (R;US)
**Forsvarets Forskningsinstitutt, Kjeller (Norway)**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2077 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway), 9:2094 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2078 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2079 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.1: Resources, 9:2111 (R;NO;In Norwegian)
Charcoal based $CO_2$-generator for use in greenhouses, 9:2650 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - possible use, 9:2651 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2652 (R;NO;In Norwegian)
$CO_2$- budget in greenhouses with $CO_2$- addition, 9:3266 (R;NO;In Norwegian)
Pyrolysis tests with Cornell retort in production of charcoal, 9:2095 (R;NO;In Norwegian)
**Framatome, 92 - Paris La Defense (France)**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2411 (R;US)
**Freie Univ. Berlin (Germany, F.R.). Fachbereich Physik**
Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3031 (R;DE;In German)

## G

**Garrett Turbine Engine Co., Phoenix, AZ (USA)**
Advanced Gas Turbine (AGT) powertrain system development for automotive applications, 9:2667 (R;US)
**Gas Processors Association, Tulsa, OK (USA)**
Vapor liquid equilibrium study of the $H_2S$-$CH_4$ system at low temperatures and elevated pressures. Research report (annual) Jan-Dec 79, 9:2083 (R;US)
**GA Technologies, Inc., San Diego, CA (USA)**
Fuel performance models for high-temperature gas-cooled reactor core design, 9:2245 (R;US)
TRISO-coated HTGR fuel pressure-vessel performance models, 9:2244 (R;US)
Tubing for augmented heat transfer, 9:2653 (R;US)
**General Accounting Office, Washington, DC (USA). International Div.**
Information on the operation of the International Energy Agency's Coal Industry Advisory Board, 9:2561 (R;US)
**General Accounting Office, Washington, DC (USA). Office of the Comptroller General**
Issues facing the future use of Alaskan NorthSlope natural gas, 9:1898 (R;US)
Legislation needed to improve administration of tax exemption provisions for electric cooperatives, 9:2533 (R;US)
**General Accounting Office, Washington, DC (USA). Procurement, Logistics, and Readiness Div.**
Questionable practices in the selection of transportation services for small lots of hazardous or sensitive cargo, 9:2534 (R;US)
**General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.**
Analysis of DOE's Sunset review, 9:2535 (R;US)
Analysis of the comprehensive energy emergency response procedures report, 9:2539 (R;US)
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2536 (R;US)
Lengthy case processing causes overlapping of electric rate increases, 9:2572 (R;US)
Opportunity to increase oil and gas exploration and lease rental income, 9:1861 (R;US)
Regional low-level radioactive waste disposal sites: progress being made but new sites will probably not be ready by 1986, 9:2057 (R;US)
Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities, 9:3344 (R;US)
State and local responses to natural gas price increases, 9:2559 (R;US)
Status of DOE's implementation of the Magnetic Fusion Energy Engineering Act of 1980, 9:4159 (R;US)
**General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center**
Experimental simulation and advanced control aspects of the IGCC concept. Part I. Simulation results, 9:1757 (R;US)
**General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.**
Troubleshooting the General Electric Company Neutron Devices Department's deionized water system, 9:2071 (R;US)
**General Research Corp., Santa Barbara, CA (USA)**
Parametric cost analysis for advanced energy concepts, 9:1758 (R;US)
**Geological Survey, Newark, DE (USA)**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1819 (R;US)
**Geological Survey, Washington, DC (USA)**
Thermal history of the Georges Bank Basin, 9:2159 (R;US)
**Geonomics, Inc., Berkeley, CA (USA)**
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 9:2179 (R;US)
**Georgia Inst. of Tech., Atlanta (USA). School of Physics**
Nuclear structure from radioactive decay. Annual progress report, 9:3922 (R;US)
**Geoservices Hydrologie S.A., Paris (France)**
Analysis of the conditions of geothermal drilling and completion, 9:2172 (R;XE;In French)
**Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)**
Calculation of dose from external photon exposures using reference human phantoms and Monte-Carlo methods. Pt. 1, 9:3979 (R;DE)
**Global Geochemistry Corp., Canoga Park, CA (USA)**
Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1876 (R;US)
**Goettingen Univ. (Germany, F.R.). Mathematisch-Naturwisnenschaftliche Fakultset**
Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°, 9:2706 (R;DE;In German)
**Goodrich (B.F.) Co., Akron, OH (USA)**
Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers, 9:2807 (R;US)
Viscoelastic loss characteristics of cord rubber composites, 9:2808 (R;US)
**Goodson and Associates, Inc., Denver, CO (USA)**
Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82, 9:1799 (R;US)
**Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii**
Calculation of temperature fields in the pulsed fusion reactor blanket elements, 9:4162 (R;SU;In Russian)
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3967 (R;SU;In Russian)
Dynamics of radiation-induced point defects in metals, 9:2692 (R;SU;In Russian)
Evolution of spontaneous magnetic fields in an expanding laser-produced plasma, 9:4163 (R;SU;In Russian)
Program complex for computation of the two-dimensional plasma distribution function in the OGRA-4 magnetic trap, 9:4058 (R;SU;In Russian)

Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core, 9:2325 (R;SU;In Russian)
To the theory of non-adiabatic transitions between degenerated states, 9:4007 (R;SU;In Russian)
Transport factors due to the dissipative ballooning models, 9:4059 (R;SU;In Russian)

**Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki**
Generalized internal long wave equations: construction, hamiltonian structure and conservation laws, 9:4018 (R;SU)
Pionino: an argument against massless gluino, 9:3839 (R;SU)
Possible mechanism of cosmological term cancellation, 9:3450 (R;SU)
Search for events having six quarks in the final state, 9:3633 (R;SU;In Russian)
Stability regions of one-dimensional solitons of a charged scalar field, 9:3838 (R;SU;In Russian)

**Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.**
Application of polynomial expansions for calculating neutron transport through spherical regions with cavities, 9:2324 (R;SU;In Russian)
Averaging of constants in the $B^2$ approximation for reactor calculation, 9:2323 (R;SU;In Russian)
Construction of Green functions by the additive operator splitting method, 9:4006 (R;SU;In Russian)
Investigation of neutron kinetics in the nanosecond range in a depleted uranium sphere, 9:3966 (R;SU;In Russian)
Measuring background by the DIN-1M spectrometer using the oscillating absorbing screen method, 9:3173 (R;SU;In Russian)
Method for calculating the temperature field in the fast reactor fuel assembly with random distribution of parameters by the Monte Carlo method, 9:2260 (R;SU;In Russian)
Method for determining the mass of stagnant liquid during an infinite rod fuel assembly flowing round, 9:2333 (R;SU;In Russian)
Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2204 (R;SU;In Russian)

**Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij**
Eigenvalue problem in the QCD simulating theory, 9:3757 (R;SU)
Energy and quantum number fluxes in $K^+p$ and $\pi^+p$ interactions at 32 and 70 GeV/c, 9:3629 (R;SU;In Russian)
Energy dependence of spin-spin correlation parameters in large-angle pp scattering, 9:3758 (R;SU;In Russian)
Hadronic heavy flavour production from the $2 \rightarrow 3$ QCD subprocess, 9:3760 (R;SU)
Heisenberg operators of generalized Toda lattice, 9:4008 (R;SU)
Liouville supersymmetrical equation for a quantum case, 9:4009 (R;SU;In Russian)
One method to calculate of color factors of Feynman diagrams, 9:3812 (R;SU;In Russian)
Properties of scalar constituents of hadrons with respect to SU(2)sub(L)xU(1) group, 9:3813 (R;SU)
Quantum theory of two-dimensional generalized Toda lattice on bounded spatial interval, 9:3834 (R;SU)
Some new results in classical theory of relativistic string, 9:3759 (R;SU)
Two-dimensional exactly and completely integrable dynamic systems (Monopoles, instantons, dual models, relativistic strings, Lund-Regge model, generalized Toda lattice, etc), 9:4037 (R;SU)

**Graz Univ. (Austria)**
Progress report 1981/82, 9:3861 (R;AT;In German)

**Grenoble-1 Univ., 38 (France)**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2283 (R;FR;In French)

**Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires**
Weak nucleon-nucleon interaction in few body systems, 9:3867 (R;FR)

**Grumman Aerospace Corp., Bethpage, NY (USA)**
High temperature active heat exchanger research for latent heat storage, 9:2520 (R;US)

**Grumman Aerospace Corp., Princeton, NJ (USA)**
Monte Carlo studies of tandem-mirror plasmas interacting with waves in the ion-cyclotron range of frequencies (ICRF). Annual report, October 1, 1982-September 30, 1983, 9:4048 (R;US)

# H

**Hagler, Bailly and Co., Washington, DC (USA)**
Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83, 9:1884 (R;US)

**Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)**
Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3031 (R;DE;In German)

**Hamburg Univ. (Germany, F.R.). Fachbereich Chemie**
Development of a radioimmunoassay of tetracycline and its derivatives, 9:3360 (R;DE;In German)

**Hamburg Univ. (Germany, F.R.). Fachbereich Physik**
Study of the particle unstable S-nucleus resonances $^5$Lisup(3/2-) and $^5$Hesup(3/2-) in the reaction $\alpha+d->\alpha+p+n$ at the c.m. energy Esub(CMS)=9.3 MeV, 9:3866 (R;DE;In German)

**Hanford Engineering Development Lab., Richland, WA (USA)**
Characteristics of spent LWR fuel relevant to its storage in geologic repositories, 9:1928 (R;US)
Correlation of yield stress changes in 316 stainless steel irradiated with high-energy and fission neutrons, 9:2689 (R;US)
Design and use of nonstandard tensile specimens for irradiated materials testing, 9:3094 (R;US)
Determination of xenon in irradiated nuclear fuel using a shielded electron microprobe, 9:1933 (R;US)
FFTF shield and gamma-ray measurements, 9:2383 (R;US)
FMIT: an accelerator-based neutron factory for fusion materials qualification, 9:4160 (R;US)
Fracture-mechanics behavior of neutron-irradiated Alloy A-286, 9:2691 (R;US)
Hydrogen mixing in compartments with a high-velocity source, 9:2415 (R;US)
Leak-rate qualification of the FFTF control area, 9:2343 (R;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2205 (R;US)
Miniature center-cracked-tension specimen for fatigue crack growth testing, 9:2690 (R;US)
Seismic analysis of a nonlinear airlock system, 9:2414 (R;US)
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2338 (R;US)
Thermal-buckling analysis of an LMFBR overflow vessel, 9:2413 (R;US)
Use of the disk bend test to assess irradiation performance of structural alloys, 9:2688 (R;US)

**Hannover Univ. (Germany, F.R.). Sonderforschungsbereich 61 Stroemungsprobleme in der Energieumwandlung**
Detection of flow mixing processes using transmission methods in high-duty heat exchanging apparatus. Final report for the sub-project E6, 9:3088 (R;DE;In German)

**Harvard Coll. Observatory, Cambridge, MA (USA)**
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3515 (R;US)

**Health Effects Research Lab., Research Triangle Park, NC (USA)**
Sample collection and preparation methods affecting mutagenicity and cytotoxicity of coal fly ash, 9:3418 (R;US)

**Hittman Corp., Columbia, MD (USA)**
Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)

**Hochtemperatur-Kernkraftwerk G.m.b.H. (HKG), Uentrop (Germany, F.R.)**
HKG business report 1981, 9:2249 (R;DE;In German)

**Hoechst A.G., Frankfurt am Main (Germany, F.R.). Werkstofftechnik**
Investigation of hydrogen embrittlement of steels for hydrogen flasks and pressure vessels, 9:2687 (R;XE;GE)

**Honeywell, Inc., Minneapolis, MN (USA). Systems and Research Center**
Multivariable control for electric-generating plants, September 1978-February 1982, 9:2568 (R;US)
Spectrophotovoltaic orbital power generation. Final Report, August 1981-November 1982, 9:2139 (R;US)

**Howard Univ., Washington, DC (USA)**
Raman spectroscopy of shocked water, 9:3545 (R;US)

**Hughes Tool Co., Culver City, CA (USA). Aircraft Div.**
Tool joint design and operating torque, 9:3071 (R;US)

# I

**IIT Research Inst., Chicago, IL (USA)**
In-reactor creep behavior of selected ferritic alloys, 9:2285 (R;US)

**Illinois Environmental Protection Agency, Springfield (USA). Air Quality Planning Section**
Economic impact of acid rain legislation on Illinois, 9:2543 (R;US)

**Illinois Office of Consumer Services, Springfield (USA)**
Consumer-related energy activities in Illinois. Final report, October 1, 1977-December 31, 1981, 9:2570 (R;US)

**Illinois Univ., Urbana (USA). Dept. of Aeronautical and Astronautical Engineering**
Flame acceleration mechanisms under conditions of partial confinement. Annual report no. 2, Feb 82-Jan 8, 9:3057 (R;US)

**Imperial, County of, El Centro, CA (USA). Dept. of Public Works**
Imperial County geothermal development annual meeting: summary, 9:2156 (R;US)

**Indian Inst. of Science, Bangalore. Centre for Theoretical Studies**
Fourier optics for the Maxwell field: formalism and applications, 9:4003 (R;US)
Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields, 9:4004 (R;US)
Realization of first order optical systems using thin lenses, 9:4005 (R;US)

**Indian Inst. of Science, Bangalore. Dept. of Physics**
Fourier optics for the Maxwell field: formalism and applications, 9:4003 (R;US)
Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields, 9:4004 (R;US)
Realization of first order optical systems using thin lenses, 9:4005 (R;US)

**Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (Germany, F.R.)**
Study on the design basis accident 'aircraft impact on nuclear power plant', 9:2416 (R;DE;In German)

**Ingenjoersvetenskapsakademien, Stockholm (Sweden)**
Solid fuels technology in the 80s, 9:2097 (R;SE;In Swedish)

**Ingersoll-Rand Research, Inc., Princeton, NJ (USA)**
Evaluation of novel coal cutting concepts for reduced dust generation. Open file report 28 Sep 79-7 Jan 81, 9:1810 (R;US)

**Innsbruck Univ. (Austria)**
Progress report 1982 of the Institute of Experimental Physics of the Leopold Franzens University Innsbruck, 9:3535 (R;AT;In German)

**Institute for Advanced Study, Princeton, NJ (USA)**
Prospects for further unification, 9:3827 (R;US)

**Institute of Gas Technology, Chicago, IL (USA)**
Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82, 9:2080 (R;US)
Field and laboratory support for the coproduction of gas and water program. Annual report 1 Apr 82-31 Mar 83, 9:1879 (R;US)
Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78, 9:1780 (R;US)
Marine biomass program: anaerobic digestion systems development and stability study. Final report 1 Feb-31 Dec 82, 9:2085 (R;US)
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1779 (R;US)

**Institute of Geological Sciences, London (UK)**
Community demonstration project: geothermal well at Southampton. Final drilling report, 9:2173 (R;XE)

**Institutet foer Vatten- och Luftvaardsforskning, Stockholm (Sweden)**
Literature survey of the composition and of the acute effects of the exhaust gases of Diesel engines, 9:3267 (R;SE;In Swedish)

**Institut National Polytechnique, 38 - Grenoble (France)**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2283 (R;FR;In French)

**Instituto de Fisica Teorica, Sao Paulo (Brazil)**
Gauge hierarchy problem, 9:3833 (R;BR)

**Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)**
Model to simulate the dynamic of a PWR pressurizer using the CSMP program, 9:2242 (B;BR;In Portuguese)
Properties of an extrapolation chamber for beta radiation dosimetry. Determination of calibration factors, 9:3178 (R;BR;In Portuguese)

**Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)**
Persistent 1.5s oscillations superimposed at a solar burst observed at two mm-wavelengths, 9:3473 (R;US)

**Instruments S.A., 94 - Ivry-sur-Seine (France)**
Apparatus for enrichment of uranium by double photoionization, 9:1922 (TG;US)

**International Atomic Energy Agency, Vienna (Austria)**
Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry, 9:2247 (R;XA)
Development on experimental VHTR instrumentation, 9:2386 (R;XA)
Isotope and radiation applications to agricultural development in Asia and the Pacific Region. Speech given during the seminar, 9:3389 (R;MY)
Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2248 (R;XA)
Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruhe, Germany, F.R., 3-7 May 1982, 9:1962 (R;XA)
Split-count technique for failed fuel detection and location, 9:2246 (R;XA)

**International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee**
Peak separation from time-of-flight spectra and problems of detector efficiency determination in neutron spectroscopy, 9:3176 (R;XA)

**International Centre for Theoretical Physics, Trieste (Italy)**
Anomaly extraction from the path integral, 9:3805 (R;XA)
Approach to gauge hierarchy in the minimal SU(5) model of grand unification, 9:3807 (R;XA)
Are lepton and quark families quantized dynamical systems, 9:3748 (R;XA)
Critical analysis of the electromagnetic mass shift problem in QCD, 9:3747 (R;XA)
Density of states, Poisson's formula of summation and Walfisz's formula, 9:3751 (R;XA)
Deuteron D-wave and the non-eikonal effects in tensor asymmetries in elastic proton-deuteron scattering, 9:3746 (R;XA)
Does nature like Nambu-Goldstone bosons, 9:3810 (R;XA)
Eight-fold way to colour geometrodynamics, 9:3797 (R;XA)
Generation of baryon excess in SU/sub L/$_2$ x SU/sub R/$_2$ x SU/sub c/$_4$, 9:3801 (R;XA)
Global quantity for dyons with various charge distributions, 9:3752 (R;XA)
Hadronic couplings of open beauty states, 9:3755 (R;XA)
Instanton-anti-instanton interaction in the O(3) non-linear $\sigma$ model and an exactly soluble fermion theory, 9:3745 (R;XA)
Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons, 9:3753 (R;XA)
Necessity of intermediate mass scales in grand unified theories with spontaneously broken CP invariance, 9:3830 (R;XA)
Neutral current weak interaction without electroweak unification, 9:3796 (R;XA)
New solution for the Schwinger model, 9:3828 (R;XA)
New vacuum structure, background strength and confinement, 9:3754 (R;XA)
Note in the msub(quark) dependence of <q-barq> from chiral perturbation theory, 9:3756 (R;XA)
Order $\alpha$Gsub($\mu$) corrections to the parity-violating electron-quark potential in the Weinberg-Salam theory: parity-violations in one-electron atoms, 9:3811 (R;XA)
Problem of the deuteron smearing corrections - 1: the conventional approach, 9:3750 (R;XA)
Quark mixing angles in the left-right symmetric model with light W/sub R/ from $K^0$-$K^0$ mixing, 9:3809 (R;XA)
Quark-lepton unification and proton decay, 9:3798 (R;XA)
Radial distribution function and second virial coefficient for interacting bosons, 9:4060 (R;XA)
Relation mr << 1 in the preon model, 9:3831 (R;XA)
Role of interaction in neutrino statistics. In memory of Bronislaw Kuchowicz, 9:3749 (R;XA)
Scalar loops and the Higgs mass in the Salam-Weinberg-Glashow model, 9:3808 (R;XA)
SO(14) unification of 3+1 families, 9:3803 (R;XA)
Spinor geometry: A genesis of extended supersymmetry, 9:4036 (R;XA)
Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3800 (R;XA)
Spontaneous breaking of global B-L symmetry and matter-antimatter oscillations in grand unified theories, 9:3804 (R;XA)

SU(N)-QCD$_2$ meson equation in next-to-leading order, 9:3806 (R;XA)
Supergroup extensions: from central charges to quantization through relativistic wave equations, 9:3829 (R;XA)
Surface terms and dual formulations of gauge theories, 9:3832 (R;XA)
Tests for complete breakdown of discrete symmetry in D neutral-anti D neutral, 9:3802 (R;XA)
Witten's charge formula, 9:3799 (R;XA)

**Iowa State Univ. of Science and Technology, Ames (USA)**
Performance of tornado-type wind turbines with radial inflow supply, 9:2188 (R;US)

**Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy**
Polar cap electron DEnsities from de-1 plasma wave observations. Progress report, 9:3500 (R;US)

**Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center**
Laser-driven shock wave studies in single and double-layered slab targets, 9:4161 (R;IL)

## J

**Japan Atomic Energy Research Inst., Tokai, Ibaraki**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2411 (R;US)

**Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment**
Development on experimental VHTR instrumentation, 9:2386 (R;XA)
JNDC nuclear data library of fission products, 9:3915 (R;JP)
Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility, 9:2408 (R;US)

**Japan Atomic Energy Research Inst., Tokyo**
APPLE-2: an improved version of APPLE code for plotting neutron and gamma ray spectra and reaction rates, 9:3182 (R;JP)
Background analysis on a detector shield system for fast neutron scattering experiments, 9:3149 (R;JP;In Japanese)
Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct, 9:3969 (R;JP)
Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3, 9:2439 (R;JP)
Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3952 (R;JP)
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3968 (R;JP)
Development of an apparatus for testing fatigue of metals at elevated temperatures in controlled environments, 9:3099 (R;JP;In Japanese)
Improvement of core mass balance calculation in REFLA-1D/MODE1, 9:2440 (R;JP)
Layer structures of oxide scales on zircaloy-4 tube exposed to steam-hydrogen mixture at high temperatures, 9:2339 (R;JP;In Japanese)
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2828 (R;JP;In Japanese)
Measurement of corrosion of mild steel in high temperature-pressure pure water under $\gamma$-irradiation, 9:2708 (R;JP;In Japanese)
Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method, 9:3098 (R;JP;In Japanese)
Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980, 9:2390 (R;JP;In Japanese)
SCTF Core-I test results. System pressure effects on reflooding phenomena, 9:2438 (R;JP)
Semiannual progress report on the NSRR experiments, (12). January, 1981 to June, 1981, 9:2389 (R;JP;In Japanese)
Simulated HLLW compositions for cold test of waste management development, 9:1992 (R;JP)
SONATINA-2V: a computer program for seismic analysis of the two-dimensional vertical slice HTGR core, 9:2250 (R;JP)
System design considerations on the cooling system of the experimental multi-purpose very high temperature gas cooled reactor, 9:2251 (R;JP;In Japanese)
TIMS-PGG: a code system for producing group constants in fast neutron energy region, 9:2329 (R;JP;In Japanese)

**Jeppson (Morris R.), Carmel, CA (USA)**
Microwave methods and apparatus for paving and paving maintenance. Final report on Phase I, 9:2643 (R;US)

**Jet Propulsion Lab., Pasadena, CA (USA)**
Origin of SiC impurities in silicon crystals grown from the melt in vacuums, 9:2121 (R;US)
Proceedings of the Flat-Plate Solar Array Workshop on the Science of Silicon Material Preparation, 9:2123 (R;US)

**Johannes Kepler Univ., Linz (Austria)**
Progress report 1982, 9:3859 (R;AT;In German)
Progress report 1981, 9:3860 (R;AT;In German)

**Joint Inst. for Nuclear Research, Dubna (USSR)**
Electroweak asymmetry in deep inelastic muon-nucleon scattering, 9:3635 (R;SU)

**Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods**
Effect of diaphragms on the electron beam stability in an induction linear accelerator, 9:3139 (R;SU;In Russian)
Electron beam formation in the injection point in the adgezator of the electron-ring accelerator prototype, 9:3138 (R;SU;In Russian)
Magnetic field formation at the electron ring extraction from the collective accelerator model, 9:3141 (R;SU;In Russian)
Specificities of magnetic field formation in the adgezator of a collective accelerator model, 9:3140 (R;SU;In Russian)
Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3188 (R;SU;In Russian)

**Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety**
Neutron detection channel with a counter based on the SNM-14 corona counter, 9:3184 (R;SU;In Russian)

**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation**
Computer code realization for a mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber, 9:3536 (R;SU;In Russian)
Simple method of energy and emission angle determination of protons registeres in heavy liquid bubble chambers, 9:3189 (R;SU;In Russian)
Symbolic evaluation of some multidimensional integrals by the computer algebraic manipulations, 9:4019 (R;SU;In Russian)

**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy**
Change of space-time characteristics of radiation region of secondary $\pi^-$-mesons produced in pion-nucleon interactions at 40 GeV/c on reference frame, 9:3637 (R;SU;In Russian)
Charmed baryon Λsub(c)sup(+) production by approximately 58 GeV neutrons on carbon, 9:3634 (R;SU)
Differential cross section of eta meson production on carbon by $\pi^-$ mesons at the momentum of 3.3 GeV/c, 9:3638 (R;SU;In Russian)
Experimental study of the pion-xenon collisions without particle production at 3.5 GeV/c: asymmetry in proton emission, 9:3907 (R;SU)
Multiwire proportional low-pressure chamber with a high gas gain coefficient, 9:3191 (R;SU;In Russian)
Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$N and $\pi^-$C interactions at 40 GeV/c in different reference frames, 9:3636 (R;SU;In Russian)

**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics**
Primitives (eigenstates) of six-quark bags with an external pion field, 9:3773 (R;SU;In Russian)
Use of the rise time discriminator for the improvement of the Ge(Li)-detector parameters, 9:3190 (R;SU;In Russian)

**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems**
Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3537 (R;SU;In Russian)
Design logic and modelling of RASTR special processor for C-detector of ARES spectrometer, 9:3187 (R;SU;In Russian)
Multiparticle event selection with neutral strange particle production. The electronic system of the RISK spectrometer, 9:3185 (R;SU;In Russian)
RASTR special processor design, 9:3186 (R;SU;In Russian)
Stabilized high voltage power supply of proportional and drift chambers, 9:3183 (R;SU;In Russian)
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3538 (R;SU;In Russian)

Two-channel time-to-digital converter, 9:3210 (R;SU;In Russian)
**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions**
Comparison of the ionooptical parameters of one- and two-stage accelerator systems, 9:3150 (R;SU;In Russian)
Cyclotron facility for acceleration of heavy ions to 20-120 MeV/nucleon, 9:3126 (R;SU;In Russian)
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3937 (R;SU;In Russian)
**Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics**
μ-capture in a liquid hydrogen, 9:3639 (R;SU;In Russian)
Constant of the baryon-meson strong interaction, 9:3770 (R;SU;In Russian)
Microscopic model for superconductor with normal state nuclei, 9:4000 (R;SU)
Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3868 (R;SU)
Nonradiative excitation of the muonic atom $^{238}$U as an inverse conversion process, 9:3936 (R;SU)
Relativistic wave functions of a nucleon as a quark-diquark bound state, 9:3771 (R;SU;In Russian)
Representations of osp(1,4) in terms of three boson pairs and matrices of arbitrary even order. Description of the method, 9:4038 (R;SU)
Short-range correlations in an extended time-dependent mean-field theory, 9:3953 (R;SU)
Some specific features of coherent radiation and particle propagation in crystals, 9:2829 (R;SU;In Russian)
Two-quasiparticle strength distributions in $^{62}$Ni and $^{206}$Pb, 9:3900 (R;SU)
Vector meson spin alignment in the fusion madel, 9:3772 (R;SU;In Russian)
Vibrational states of deformed odd nuclei, 9:3923 (R;SU;In Russian)
**Joint Publications Research Service, Arlington, VA (USA)**
Prediction and identification of cosmic solar radiation flux and spectra, 9:3459 (R;US)

## K

**Kansas Univ. Center for Research, Inc., Lawrence (USA)**
An investigation of the internal and external aerodynamics of cattle trucks. Final Report, 9:2638 (R;US)
**Kennedy/Jenks Engineers, Sacramento, CA (USA)**
Applicability of ratemaking and lifeline-rate standards of PURPA, 9:2571 (R;US)
**Kernenergie-Studiengesellschaft - Studiengesellschaft zur Foerderung der Kernenergieverwertung in Schiffbau und Schuffahrt e.V., Hamburg (Germany, F.R.)**
Three Mile Island 2. The accident of March 28, 1979, as seen from the point of view of radiation protection experts, 9:2434 (R;DE;In German)
**Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Abt. Sicherheit und Strahlenschutz**
Quantifying remarks to the question of uncertainties of the 'general dose assessment fundamentals', 9:3302 (R;DE;In German)
**Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2252 (R;DE;In German)
Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2441 (R;DE;In German)
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1930 (R;DE;In German)
**Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentralabteilung Brennelement- und Bestrahlungstechnologie**
Neutron spectra unfolding from measured detector activations, 9:3192 (R;DE;In German)
**Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik**
Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN, 9:1938 (TG;US)
**Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik**
Auxiliary systems, 9:2226 (R;DE)
Chemical operating experience in several European pressurized water reactor plants, 9:2230 (R;DE)
Cooling systems, emergency cooling, recooling, 9:2418 (R;DE)
Core design with respect to the safety concept, 9:2436 (R;DE)
Different types of intermediate storages, 9:1942 (R;DE)
Dynamics of a nuclear power plant. Behaviour of PWR plants during malfunctions and accidents, 9:2420 (R;DE)
Dynamics of a nuclear power plant. Behaviour of PWR plants in normal and upset operation, 9:2421 (R;DE)
Experience with the storage of high active waste at WAK, 9:1946 (R;DE)
Handling and storage of high-level liquid wastes from reprocessing of spent fuel, 9:1967 (R;DE)
IAEA code and safety guides on licensing, 9:2306 (R;DE)
Inspection and maintenance plans. In-service inspections, 9:2345 (R;DE)
International regulations for radiation protection, 9:1964 (R;DE)
Introduction - types and quantitites of nuclear waste - principles of waste management, 9:1966 (R;DE)
Layout of the components: Primary system components (class I), 9:2422 (R;DE)
Licensing of nuclear power plants in Brazil, 9:2305 (R;DE)
Overview of the need of manpower supply for a nuclear programme, 9:2317 (R;DE)
Procedures for maintenance and repairs, 9:2228 (R;DE)
Pt. 1: Decommissioning of nuclear facilities. Pt. 2: Methods of decommissioning of nuclear facilities, 9:2388 (R;DE)
PWR and BWR safety systems layout, 9:2419 (R;DE)
Radioactive waste disposal in the sea and alternative methods of ultimate disposal, 9:1985 (R;DE)
Report of consultants to the IAEA on requirements for the safe transport of low hazard radioactive materials, 9:1929 (R;DE)
Safety philosophy and licensing practice in different member states of IAEA: Canada, 9:2303 (R;DE)
Safety systems of heavy water reactors and small power reactors, 9:2211 (R;DE)
Secondary systems of PWR and BWR, 9:2210 (R;DE)
Site evaluation for disposal facilities in salt, 9:1984 (R;DE)
Technical, environmental and regulatory aspects of waste management and their reflection in the IAEA programme, 9:1965 (R;DE)
Treatment of concentrated waste for storage - fixation of concentrated gaseous waste, 9:1963 (R;DE)
Treatment of concentrated waste for storage and disposal, 9:1986 (R;DE)
Treatment of Pu-containing waste by acid digestion (wet combustion), 9:1983 (R;DE)
Waste management and the nuclear fuel cycle, 9:2318 (R;DE)
Waste management at the Karlsruhe Nuclear Research Center, 9:1987 (R;DE)
Water systems, 9:2227 (R;DE)
Workshop on safety analysis reports and licensing procedures. Pt. 1 A, 9:2229 (R;DE)
**Kiel Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet**
Imperfections and phase transformations by mono-N-alkylammonium-uranium glimmers, 9:3041 (R;DE;In German)
Investigations on heavy methal complexing by humin substances in estuaries, 9:2978 (R;DE;In German)
**Knolls Atomic Power Lab., Schenectady, NY (USA)**
Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2443 (R;US)
Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program), 9:2286 (R;US)
Core subchannel thermal-hydraulic analysis methods and critical heat-flux margin in a light-water breeder reactor, 9:2287 (R;US)
Local heat transfer where heated rods touch in axially flowing water, 9:2442 (R;US)

**Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet**
Radiation induced modification of polyurethane for biomedical applications, 9:3032 (R;DE;In German)
**Korea Advanced Energy Research Inst., Seoul (Republic of Korea)**
Survey of fusion reactor technology. Development of design technology for the magnet system of Tokamak fusion reactor, 9:4182 (R;KR;In Korean)
**Kraftwerk Union A.G., Erlangen (Germany, F.R.)**
Comparison of neutron transport calculations with NRC test results. Final report, 9:2328 (R;DE;In German)
**Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.**
Flow test for the full scale core mockup of the KUHFR, (1). Velocity distribution and pressure loss in the core, 9:2391 (R;JP;In Japanese)
Report of research by common utilization in Research Reactor Institute, Kyoto University, in first half of fiscal 1980, 9:2392 (R;JP;In Japanese)

## L

**Laboratoires d'Electronique et de Physique Appliquee (LEP), 94 - Limeil-Brevannes (France)**
Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies, 9:4241 (R;XE)
**Laenstyrelsen i Malmoehus Laen, Malmoe (Sweden)**
Emergency plans for nuclear power accidents. Danish-Swedish exercise Oct 7th 1982, 9:2437 (R;SE;In Swedish)
**Lawrence Berkeley Lab., CA (USA)**
Investigation of equivalent porous medium permeability in networks of discontinuous fractures, 9:3442 (R;US)
Performance and materials aspects of Ge:Be and Ge:Ga photoconductors for far-infrared detection, 9:3211 (R;US)
Rechargeability of the zinc electrode in alkaline electrolyte, 9:2526 (R;US)
Regulation and system interdependence: effects on the siting of California electrical energy facilities, 9:2573 (R;US)
Research topics in statistical database management, 9:4263 (R;US)
Some recent advances in uranocene chemistry, 9:2915 (R;US)
Status of the Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory free electron laser (FEL), 9:3158 (R;US)
**Lawrence Livermore National Lab., CA (USA)**
Apparatus for enrichment of uranium by double photoionization, 9:1922 (TG;US)
Apparatus for isotopic separation using a high-frequency wave and coherent radiation, 9:1923 (TG;US)
Approach to real-time holography, 9:4252 (R;US)
BAGI: a new concept for the detection and tracking of hazardous gases, 9:1887 (R;US)
Beta-dosimetry studies at LLNL, 9:3981 (R;US)
Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3458 (R;US)
Control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 9:4198 (R;US)
Design and construction of large capacitor banks, 9:4195 (R;US)
EE/NESD computer-aided engineering FY '84 plan, 9:4251 (R;US)
Effects of site characteristics on near-source recordings of strong ground motion, 9:3438 (R;US)
Engineering work stations in the national laboratory, 9:4253 (R;US)
Environmental assessment for spill tests of $NH_3$ and $N_2O_4$ at Frenchman Flat, Nevada Test Site. Revision 1, 9:3273 (R;US)
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1827 (R;US)
Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report, 9:2674 (R;US)
Generation of vibrationally excited $H_3$ molecules by $H_3^+$ wall collisions, 9:3546 (R;US)
Glass produced by underground nuclear explosions, 9:3258 (R;US)
Granular flow considerations in the design of a cascade solid breeder reaction chamber, 9:4194 (R;US)
Improved solid-state laser sources. Final technical report, 2 June 1981-1 June 1982, 9:3084 (R;US)
Inexpensive solid-state trigger unit for thyratrons, 9:3108 (R;US)
Initial specifications for nuclear waste package external dimensions and materials, 9:2005 (R;US)
Investigations of the mechanical behavior of spot welded joints by means of acoustic emission analysis, 9:3103 (TG;US)
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4197 (R;US)
LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices, 9:1885 (R;US)
Maximum entropy reconstruction of a volume anomaly from pulse scatter data, 9:3102 (R;US)
Mechanical property measurements on Nellis Baseline Sand and Dry CARES Sand, 9:3443 (R;US)
Neutron and gamma-ray measurements on the LANL Little Boy Comet Assembly, 9:2396 (R;US)
Numerical electromagnetics code - method of moments. User's guide supplement for NEC-3 for modeling buried wires, 9:3107 (R;US)
Numerical solution to the steady state equation of transfer in azimuthally symmetric geometries, 9:3089 (R;US)
Optimized rotary flux compressors for powering laser flashlamps, 9:4196 (R;US)
Photodetachment technology, 9:4199 (R;US)
Power and phase spectra for detonating cord, 9:3437 (R;US)
Proceedings: 17th Asilomar conference on fire and blast effects of nuclear weapons, 9:3232 (R;US)
Process and apparatus for the separtaion of isotopes, 9:1921 (TG;US)
Process for isotope separation, 9:1924 (TG;US)
Process for separation of isotopes from a gaseous mixture, 9:1926 (TG;US)
Raman spectroscopy of shocked water, 9:3545 (R;US)
Recent results in simulating LNG vapor dispersion over variable terrain. Revision 1, 9:1886 (R;US)
Reliability analysis for stiff versus flexible piping, 9:2212 (R;US)
Reproducibility of chemical analyses of raw Colorado oil shales, 9:1909 (R;US)
Response to W.W. Kellogg carbon dioxide and climatic change: implications for mankind's future, 9:3274 (R;US)
Some predictions on the performance of future supercomputers for simulation and control, 9:4254 (R;US)
Status of the Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory free electron laser (FEL), 9:3158 (R;US)
Streak cameras for soft x-ray and optical radiation, 9:4084 (R;US)
Theory of pulse propagation in fluid-saturated porous layers, 9:4021 (R;US)
Time-resolved beam-profile measurements on the Experimental Test Accelerator (ETA), 9:3143 (R;US)
Use of wrist albedo neutron dosimeters, 9:3201 (R;US)
Welding of uranium and uranium alloys, 9:2713 (R;US)
**Lewin and Associates, Inc., Washington, DC (USA)**
Enhanced oil recovery: a strategy for improving domestic production, 9:1826 (R;US)
**Little (Arthur D.), Inc., Cambridge, MA (USA)**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2623 (R;US)
Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3327 (R;US)
Stirling engine application study, 9:2671 (R;US)
**Los Alamos National Lab., NM (USA)**
Angle-averaged Compton cross sections, 9:3542 (R;US)
Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3776 (R;US)
Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3458 (R;US)
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3914 (R;US)
Deuteron forward photodisintegration: meson currents and relativity, 9:3872 (R;US)
Electron-electron interactions and broken symmetry in one dimension, 9:3541 (R;US)
Energy distributions and yields of secondary ions and electrons emitted by GIOTTO during Halley encounter, 9:3456 (R;US)
Fabrication of a hermetically sealed connector, 9:3104 (R;US)
Gamma-burst emission from neutron-star accretion, 9:3452 (R;US)

Geothermal pumping systems, 9:2174 (R;US)
Joint timing analysis of A0535 + 26 at 1980 outburst, 9:3453 (R;US)
LARC: computer codes for Lagrangian analysis of stress-gauge data to obtain decomposition rates through correlation to thermodynamic variables, 9:3228 (R;US)
Log N-log S is inconclusive, 9:3454 (R;US)
Los Alamos laser simulation of high-altitude nuclear-explosion effects. Final report, 9:3257 (R;US)
Microinstabilities in the high latitude F region: a brief review, 9:3504 (R;US)
Modular stellarator reactor: a fusion power plant, 9:4184 (R;US)
Multidomain, multirecord-type Datatrieve-11 databases, 9:4261 (R;US)
No-neutrino double beta decay: more than one neutrino, 9:3712 (R;US)
Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine, 9:3123 (R;US)
Numerical simulations of convectively excited gravity waves, 9:3457 (R;US)
Optical diagnostics for condensed-phase shock-compressed molecular systems, 9:3229 (R;US)
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3417 (R;US)
Physics with LAMPF II, 9:3640 (R;US)
Plasma effects on Heliac configurations: a preliminary investigation, 9:4077 (R;US)
Probabilistic planning and budgeting for R & D programs involving activities of high uncertainty, 9:4242 (R;US)
Processing time using Datatrieve-11, clunks, and FORTRAN, 9:4260 (R;US)
Production of negative $D^-$ ions by double charge exchange using cesium, 9:4231 (TG;US)
Production of pions, kaons, and muons by 16-GeV protons, 9:3774 (R;US)
Resonance ionization mass spectrometry at Los Alamos National Laboratory, 9:3194 (R;US)
Scattering and absorption of light by soot particles, 9:4020 (R;US)
Superconducting ground state of a strongly interacting electron system: $UBe_{13}$, 9:2711 (R;US)
Ten years of Vela x-ray observations, 9:3455 (R;US)
Two-phase flow studies, 9:2175 (R;US)
Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides, 9:2115 (R;US)

**Louisiana State Univ., Baton Rouge (USA). Dept. of Chemistry**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3007 (R;US)

**Lulea Univ., (Sweden)**
Heat storage in rock: Multiple well system, 9:2518 (R;US)

## M

**Mainz Univ. (Germany, F.R.). Inst. fuer Kernphysik**
Beam profile monitor systems for the 180 MeV stage of MAMI, 9:3145 (TG;US)

**Manitoba Univ., Winnipeg (Canada)**
Symmetries and the N-N interaction, 9:3820 (R;CA)

**Marburg Univ. (Germany, F.R.). Fachbereich Humanmedizin**
Interference factors in digoxin analysis, especially in the serum of pregnant women, by RIA. Clinical aspects, methods, comparative studies using different RIA techniques, 9:3359 (R;DE;In German)

**Marburg Univ. (Germany, F.R.). Fachbereich Physik**
Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface, 9:2916 (R;DE;In German)

**Marburg Univ. (Germany, F.R.). Fachbereich Physikalische Chemie**
Raman and infrared spectroscopic studies of the structure of water ($H_2O$, HOD, $D_2O$) in stoichiometric crystalline hydrates and in electrolyte solutions, 9:3534 (R;DE)

**Martin Marietta Aerospace, Denver, CO (USA)**
Molten salt thermal energy storage subsystem for solar thermal central receiver plants, 9:2152 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA)**
Stochastic stability research for complex power systems, 9:2566 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA). Aeroelastic and Structures Research Lab.**
Some experiments on yaw stability of wind turbines with various coning angles, 9:2187 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry**
Characterization and photochemistry of surface-confined mononuclear and trinuclear phosphine/carbonyl complexes of ruthenium(0). Interim technical report, 9:3003 (R;US)
Chemically derivatized semiconductor photoelectrodes. Interim technical report, 9:2104 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA). Lab. for Information and Decision Systems**
Large-scale-system effectiveness analysis, 9:2567 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center**
Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments, 9:4051 (R;US)

**Massachusetts Inst. of Tech., Cambridge (USA). Research Lab. of Electronics**
Study of excited state energy transfer processes. Final report 1 Jan 81-31 Dec 82, 9:3512 (R;US)

**Massachusetts Univ., Amherst (USA). Dept. of Physics and Astronomy**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3904 (R;US)

**Massachusetts Univ., Amherst (USA). Materials Research Lab.**
Radiolysis of resist polymers. IV. Poly(p-substituted-alpha-methylstyrenes). Technical report, 9:3030 (R;US)

**Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.). Inst. fuer Werkstoffwissenschaften**
Detection of the change in mean inner potential at dislocations in grain boundaries in NiO, 9:2780 (R;US)

**McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)**
Sources of surface magnetic field variability. Final report, 9:3498 (R;US)

**McMaster Univ., Hamilton, Ontario (Canada)**
Bruce nuclear project, 9:2316 (R;CA)

**Medical Coll. of Wisconsin, Milwaukee (USA)**
CP/MAS $^{13}C$ NMR spectroscopic study of chlorophyll a in the solid state, 9:3351 (R;US)

**Medical Univ. of South Carolina, Charleston (USA)**
Geothermal Project. Final report, 9:2178 (R;US)

**Michigan State Univ., East Lansing (USA). Dept. of Forestry**
Tree species and management strategies for biomass production in the Lake States. Fuels from woody biomass. Annual report, March 1, 1980-February 28, 1981, 9:2107 (R;US)

**Michigan Univ., Ann Arbor (USA)**
Viscoelastic loss characteristics of cord rubber composites, 9:2808 (R;US)

**Michigan Univ., Ann Arbor (USA). Dept. of Mechanical Engineering**
Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers, 9:2807 (R;US)

**Middlesex County Dept. of Solid Waste Management, New Brunswick, NJ (USA)**
Resource Recovery Co-Disposal Demonstration Project, Middlesex County, New Jersey: feasibility study and recommendation for implementation. Final report, 9:2661 (R;US)

**Ministry of Defence, Aldermaston (UK). Atomic Weapons Research Establishment**
Calculation of the shielding effect of solid shell enclosures, 9:3964 (R;GB)

**Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.**
Amount of biogas and its availability for use in Finland, 9:2114 (R;FI;In Finnish)
Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2562 (R;FI;In Finnish)
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2112 (R;FI;In Finnish)
Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2113 (R;FI;In Finnish)
Energy conservation of ventilation in commercial and public buildings. Basis. Method file, 9:2618 (R;FI;In Finnish)
Industrial local exhaust systems, 9:3268 (R;FI;In Finnish)
Potential production and consumption figures of indigenous fuels in Finland, 9:2577 (R;FI;In Finnish)

**Mission Research Corp., San Diego, CA (USA)**
Nuclear-induced lightning aurora experiment. Technical report, 9:3501 (R;US)
**Monsanto Research Corp., Miamisburg, OH (USA). Mound**
PETN homolog analysis and large-scale preparation of pure PETN homologs by high-performance liquid chromatography (HPLC), 9:3230 (R;US)
Quantitative determination of hydrogen by pulsed nuclear magnetic resonance spectroscopy, 9:2901 (R;US)
**Montpellier-2 Univ., 34 (France)**
Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3393 (R;FR;In French)
**MSA Research Corp., Evans City, PA (USA)**
Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82, 9:1808 (R;US)
**Museum of Fine Arts, Boston, MA (USA). Research Lab.**
Area group: an example of style and paste compositional covariation in Maya pottery, 9:4237 (R;US)
Compositional attribution of non-provenienced Maya polychrome vessels, 9:2889 (R;US)

## N

**Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)**
Energy supplies. Proposals for research and development after 1984, 9:2578 (R;SE;In Swedish)
Final report on fluidized bed materials. Stage 4, 9:3117 (R;SE;In Swedish)
Peat-fired electric power plants, 9:1816 (R;SE;In Swedish)
Test plant for wind power Kalkugnen 1977-1980. Summary of operation results, 9:2189 (R;SE;In Swedish)
**Nagoya Univ. (Japan)**
Test of lead glass shower counters, 9:3198 (R;US)
**Nagoya Univ. (Japan). Dept. of Astrophysics**
Joint timing analysis of A0535 + 26 at 1980 outburst, 9:3453 (R;US)
**Nagoya Univ. (Japan). Inst. of Plasma Physics**
Analysis of current drive by travelling wave based on theory of intrinsic stochasticity, 9:4071 (R;JP)
Bremsstrahlung energy loss of degenerate plasma, 9:4170 (R;JP)
Conversion of compressional Alfven waves into ion cyclotron waves in inhomogeneous magnetic fields, 9:4065 (R;JP)
Determination of metastable fraction in an ion beam extracted from ECR plasma, 9:4073 (R;JP)
Electron cyclotron heating of stellarator plasma with the ordinary and the extraordinary modes in JIPP T-II, 9:4064 (R;JP)
Evolution of ring current formed by relativistic electron beam injection into a charge but not current neutralizing plasma, 9:4072 (R;JP)
Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4070 (R;JP)
Formation of relativistic electron beam rings in a conducting cavity, 9:4074 (R;JP)
Heat flux in the presence of shifting cold and hot electron Maxwellian distributions, 9:4067 (R;JP)
Mode conversion and local heating below the second electron cyclotron harmonic, 9:4066 (R;JP)
Population inversion in an optically thick recombining hydrogen plasma, 9:4063 (R;JP)
Possible method for burn control by compression-decompression, 9:4069 (R;JP)
Stabilization of electrostatic flute mode due to hot electron ring and rf field, 9:4068 (R;JP)
**NAHB Research Foundation, Inc., Rockville, MD (USA)**
Assessment of solar technology in the home-building industry. Final report, 9:2145 (R;US)
**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**
Cycle life test and failure model of nickel-hydrogen cells, 9:2527 (R;US)
Economic competitiveness of fuel cell onsite integrated energy systems, 9:2590 (R;US)
IGCC performance comparison for variations in gasifier type and gas turbine firing temperature, 9:2193 (R;US)
Testing and performance characteristics of a 1-kW free piston Stirling engine, 9:2672 (R;US)
**National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center**
An electron-positron jet model for the galactic center, 9:3463 (R;US)
Comparison of photon-photon and photon-magnetic field pair production rates, 9:3464 (R;US)
Criteria for grasar action in astrophysical sources, 9:3471 (R;US)
Electron-positron annihilation and the cosmic X-ray background, 9:3469 (R;US)
Gamma-burst emission from neutron-star accretion, 9:3452 (R;US)
Implications of HEAO-3 data for the acceleration and propagation of galactic cosmic rays, 9:3461 (R;US)
Low-temperature positron annihilation, 9:3466 (R;US)
Microcircuit radiation effects databank, 9:3208 (R;US)
NASA/Goddard Space Flight Center contributions to the Workshop on Positron-Electron Pairs in Astrophysics, 9:3462 (R;US)
Pair production and annihilation in strong magnetic fields, 9:3465 (R;US)
Pair production near threshold in pulsar magnetic fields, 9:3468 (R;US)
The origin of the galactic annihilation radiation, 9:3470 (R;US)
Upper limits to the annihilation radiation luminosity of Centaurus A, 9:3467 (R;US)
**National Aeronautics and Space Administration, Washington, DC (USA)**
Energy. A continuing bibliography with indexes, issue 36, January 1983, 9:4262 (R;US)
**National Bureau of Standards, Boulder, CO (USA)**
Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83, 9:1880 (R;US)
Time-dependent study of radiation trapping by time-delayed two-photon absorption, 9:3544 (R;US)
**National Bureau of Standards, Washington, DC (USA). Inst. for Applied Technology**
Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3033 (R;US)
**National Center for Appropriate Technology, Butte, MT (USA)**
Photovoltaics in the Pacific Islands: an introduction to PV systems, 9:2136 (R;US)
**National Center for Resource Recovery, Inc., Washington, DC (USA)**
Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981, 9:2646 (R;US)
**National Fertilizer Development Center, Muscle Shoals, AL (USA)**
New developments in fertilizer technology, 9:2545 (R;US)
**National Lab. for High Energy Physics, Oho, Ibaraki (Japan)**
Test of lead glass shower counters, 9:3198 (R;US)
**National League of Cities, Washington, DC (USA)**
Municipal Energy Conservation Project. Final report, 9:2666 (R;US)
**National Research Lab. of Metrology, Sakura, Ibaraki (Japan)**
Bending elasticity of circularly notched bars as monolithic flexure hinges in precision mechanisms, 9:3060 (TG;US)
**Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)**
Complex of hardware and software means for fission product detection in the fast reactor sodium coolant and cover gas, 9:2393 (R;SU;In Russian)
**Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)**
Calculation of the mechanical strength of the T-15 tokamak discharge chamber, 9:4188 (R;SU;In Russian)
Development and study of the first-stage amplification unit of the TIR-1M $CO_2$-laser installation, 9:4078 (R;SU;In Russian)
Normal phase detection in the "Tokamak-15" toroidal coil, 9:4185 (R;SU;In Russian)
Numerical simulation of the operation regimes of the poloidal field system of a tokamak reactor, 9:4186 (R;SU;In Russian)
Study on the poloidal magnetic fields in the "Tuman-3" device, 9:4187 (R;SU;In Russian)
To the calculation of stress-strained state of the discharge chambers of tokamak devices, 9:4189 (R;SU;In Russian)

**Naval Research Lab., Washington, DC (USA)**
Observation of magnetic fields in laser-produced plasma using the Zeeman effect, 9:4190 (R;US)
Variation of laser absorption with plasma scalelength in long-scalelength plasmas, 9:4191 (R;US)
**Naval Surface Weapons Center, Silver Spring, MD (USA)**
Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82, 9:2523 (R;US)
**Naval Weapons Center, China Lake, CA (USA)**
Geothermal potential of Marine Corps Mountain Warfare Training Center at Pickel Meadow, California. Technical memo, 9:2155 (R;US)
**NCB (IEA Grimethorpe) Ltd., Barnsley, South Yorkshire (UK)**
Fluidised-bed combustion project, Grimethorpe Experiment Facility: materials monitoring and evaluation plan for Test Series 2, 9:3113 (R;US)
**Nevada Univ., Las Vegas (USA). Desert Research Inst.**
Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2051 (R;US)
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2052 (R;US)
**New Hampshire Governor's Council on Energy, Concord (USA)**
State Heating Oil Grants Program. Final report, September 1, 1982-May 31, 1983, 9:1856 (R;US)
**New Mexico Highlands Univ., Las Vegas (USA). Div. of Science and Mathematics**
Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982, 9:1797 (R;US)
**New Mexico Inst. of Mining and Technology, Socorro (USA)**
Gamma-burst emission from neutron-star accretion, 9:3452 (R;US)
**New Mexico Univ., Albuquerque (USA)**
Second-order adaptive infinite impulse response filter, 9:3106 (R;US)
**New York Energy Office, Albany (USA)**
New York State Energy Office fuel-Oil Conservation Marketing Program. Final report, 9:2610 (R;US)
**New York Univ., NY (USA). Dept. of Applied Science**
Experimental investigation of fuel vaporization on combustion efficiency, 9:2626 (R;US)
**Nicolet Analytical Corp., Madison, WI (USA)**
CP/MAS $^{13}C$ NMR spectroscopic study of chlorophyll a in the solid state, 9:3351 (R;US)
**Norske Veritas, Oslo**
Season variations of wave power in Norway, 9:2184 (R;NO)
Wave motion and energy transmission derived from wave records, 9:2185 (R;NO)
**North Carolina State Univ., Raleigh (USA)**
Measurements of the microwave power in the wall at EBT-I/S, 9:4045 (R;US)
**North Carolina Univ., Chapel Hill (USA). Dept. of Chemistry**
Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983, 9:3006 (R;US)
**North Carolina Univ., Chapel Hill (USA). Dept. of Environmental Sciences and Engineering**
Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area, 9:3339 (R;US)
**Nuclear Energy Agency, 75 - Paris (France)**
Sub-seabed burial of radioactive waste and liabilities, 9:1988 (R;FR;In French)
**Nuclear Regulatory Commission, Washington, DC (USA)**
Feasibility study on feed and bleed for pressurized-water reactors, 9:2409 (R;US)
**Nuclear Regulatory Commission, Washington, DC (USA). Div. of Technical Information and Document Control**
Nuclear Regulatory Commission Issuances, February 1983. Vol. 17, No. 2, 9:2309 (R;US)
Nuclear Regulatory Commission issuances, January 1983. Vol. 17, No. 1, 9:2308 (R;US)
**Nuclear Regulatory Commission, Washington, DC (USA). Office for Analysis and Evaluation of Operational Data**
Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2444 (R;US)
**Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation**
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289), 9:2310 (R;US)
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289). Volume 2. Appendices, 9:2311 (R;US)
**NUS Corp., Gaithersburg, MD (USA)**
Draft issue of proposed document entitled Management Program to Assure Quality, 9:4240 (R;US)

## O

**Oak Ridge Gaseous Diffusion Plant, TN (USA)**
Diode laser spectrometry for monitoring acetylene on-line in a liquefaction plant, 9:2895 (R;US)
Sampling and characterization of aerosols formed in the atmospheric hydrolysis of $UF_6$, 9:3279 (R;US)
**Oak Ridge National Lab., TN (USA)**
1982 US-CEC neutron personnel dosimetry intercomparison study, 9:3980 (R;US)
Analytical chemistry of polycyclic aromatic hydrocarbons present in coal-fired power plant fly ash, 9:2890 (R;US)
Batch method of measuring sorption ratios, 9:3293 (R;US)
Changing energy research priorities, 9:2547 (R;US)
Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2288 (R;US)
Characterization of water quality for regional planning, 9:3331 (R;US)
Chemical characterization and toxicologic evaluation of airborne mixtures. Chemical characterization of combusted inventory red and violet smoke mixes. Final report 1981-1982, 9:3262 (R;US)
Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983, 9:4243 (R;US)
Climate-chemistry connection, 9:3263 (R;US)
Collective aspects of charged particle track structure in non-metallic solids, 9:3170 (R;US)
Comparison of actual electricity savings with audit predictions in the BPA residential weatherization pilot program, 9:2628 (R;US)
Control of redox conditions during sorption measurements, 9:2913 (R;US)
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2654 (R;US)
Effects of hydrotreatment on the composition of mutagenic fractions of a coal-derived petroleum substitute, 9:1788 (R;US)
Evaluation of developmental industrial hygiene instrumentation at the University of Minnesota-Duluth gasifier, 9:3269 (R;US)
Hazard-mitigation potential of earth-sheltered residences. Final report, 1982-1983, 9:4277 (R;US)
Heavy ions, targets, and research at HHIRF, 9:3147 (R;US)
Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN, 9:1938 (TG;US)
Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)
Magnetic form factor measurements in cerium hexaboride, 9:2779 (R;US)
Mathematical modeling of TES subsystems, 9:2519 (R;US)
Measurements of the microwave power in the wall at EBT-I/S, 9:4045 (R;US)
Measuring effects of utility conservation programs: inputs to utility decision making, 9:2594 (R;US)
Modification for correcting a vacuum design fault in the Veeco Model MS 170 Leak Detector, 9:4192 (R;US)
Oak Ridge National Laboratory ELMO Bumpy Torus radially resolved, time-dependent, one-dimensional transport code - user's guide, 9:4081 (R;US)
Observation of hot-electron ring instabilities in ELMO Bumpy Torus, 9:4082 (R;US)
Overview of the Wharton School assessments of the short-term integrated forecasting system (STIFS), 9:2538 (R;US)

Performance characterization of pneumatic single pellet injection system, 9:4152 (R;US)
Preionization and start-up in the ISX-B tokamak using electron cyclotron heating at 28 GHz, 9:4079 (R;US)
Professionalism in commercial infrared sensing: an update, 9:2665 (R;US)
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2404 (R;US)
Research opportunities in salt hydrates for thermal energy storage, 9:2521 (R;US)
Stirling engines with controlled evaporation of a two-phase two-component working fluid, 9:2670 (R;US)
Structure activity relationships: their function in biological prediction, 9:3409 (R;US)
Two-level compromise designs for estimating main effects and detecting interactions, 9:4248 (R;US)
Verification of the DOE Model Audit, 9:2627 (R;US)
WHISTBT: a 1-1/2-D radial-transport code for bumpy tori, 9:4080 (R;US)
Wide-range vortex shedding flowmeter for high-temperature helium gas, 9:2282 (R;US)

**Oak Ridge Y-12 Plant, TN (USA)**
Pilot-plant studies for solvent extraction of polychlorinated biphenyl (PCB), 9:3112 (R;US)
Welding of uranium and uranium alloys, 9:2713 (R;US)

**Oesterreichische Akademie der Wissenschaften, Vienna**
Progress report 1981, 9:3857 (R;AT)
Progress report 1982, 9:3858 (R;AT)

**Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.**
Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3196 (R;AT;In German)
Flash lamp annealing of ion implanted boron profiles, 9:2832 (R;AT;In German)
Investigations on the monitoring of structural integrity and fault location for civil engineering prestressed concrete structures by acoustic emission analysis, 9:3100 (R;AT;In German)
Radioisotope applications in industry. Part 2: Practical applications, 9:3195 (R;AT;In German)
Sea dumping of radioactive wastes. Part 1: Basic considerations of marine environment, 9:1996 (R;AT;In German)
Sea dumping of radioactive wastes. Part 2: Behaviour of radionuclides in seawater, 9:1997 (R;AT;In German)
Sea dumping of radioactive wastes. Part 3: Dumping practice and radioecology, 9:1998 (R;AT;In German)

**Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science**
Development of a thermodynamic-properties correlation framework for the coal-conversion industry. Final report, September 1, 1980-August 31, 1983, 9:1790 (R;US)

**Oljedirektoratet, Stavanger (Norway)**
Feasibility of leak detection in process plant on offshore installations, 9:1852 (R;NO)

**Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Center**
Final administrative report for technology transfer and information dissemination, January 1, 1982-March 31, 1983, 9:2177 (R;US)

**Oregon Univ., Eugene (USA). Solar Radiation Monitoring Lab.**
Pacific Northwest solar radiation data, 9:3259 (R;US)

**Orleans Univ., 45 (France)**
Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4057 (R;FR;In French)

**Osaka Univ., Suita (Japan). Inst. of Laser Engineering**
Generation of super-fast ions due to nonlinear processes near the quarter critical density in laser-produced plasmas, 9:4061 (R;JP)

**Oxford Univ. (UK). Dept. of Engineering Science**
Optically-pumped mercury vapour cell in coaxial geometry. No. 1. Transport of resonance radiation, 9:2918 (R;US)
Optically-pumped mercury vapour cell in coaxial geometry. 2. Optical pumping by lines in the visible triplet, 9:2919 (R;US)

## P

**Pacific Northwest Lab., Richland, WA (USA)**
Assessment of cold-climate environmental research priorities. Appendixes A, B, 9:2544 (R;US)
Guide to radiation fixatives, 9:3044 (R;US)
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids, 9:1817 (R;US)
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3420 (R;US)
High-level waste description, inventory and hazard, 9:1948 (R;US)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:2002 (R;US)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:2004 (R;US)
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2449 (R;US)
Overview for DOE's Biomass Thermochemical Conversion Program, 9:2086 (R;US)
Potential low-level waste disposal limits for fusion radionuclides, 9:2066 (R;US)
PUREX environmental radiological surveillance - preoperational and operational support program conducted by Pacific Northwest Laboratory, 9:3280 (R;US)
Research topics in statistical database management, 9:4263 (R;US)
Residential conservation investments: a practical guide to retrofitting, 9:2630 (R;US)
Status, direction, and critical issues of waste treatment technology, 9:2003 (R;US)
Summary results of the LOCA Simulation Program conducted in NRU, 9:2450 (R;US)

**Paris-6 Univ., 75 (France)**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3039 (R;FR;In French)
Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions, 9:3738 (R;FR;In French)

**Paris-11 Univ., 91 - Orsay (France)**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves, 9:2821 (R;FR;In French)

**Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire**
Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3899 (R;FR)
Ground state baryons in the non-relativistic quark model, 9:3769 (R;FR)
New ISR and collider anti p-p and p-p data and asymptotic theorems, 9:3632 (R;FR)
Nuclear excitations in the nuclear response theory, 9:3951 (R;FR)
Remarkable properties of the broken pair model 2 relation with the quasi-particle scheme, 9:3950 (R;FR)
Some aspects of recent progress in the study of giant resonances, 9:3906 (R;FR;In French)
Spin dependence in N anti N at low energy, 9:3768 (R;FR)

**Peabody-Gordon-Piatt, Inc., Winfield, KS (USA)**
Direct combustion of industrial dry, composite waste in suspension. Final report, 9:2648 (R;US)

**Pennsylvania State Univ., University Park (USA)**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1791 (R;US)
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3264 (R;US)

**Pennsylvania State Univ., University Park (USA). Coal Research Section**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1789 (R;US)

**Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering**
Laser micropyrolysis of coal macerals. Final report Oct 79-Mar 83, 9:1778 (R;US)

**Pennsylvania State Univ., University Park (USA). Materials Research Lab.**
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2076 (R;US)
**Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering**
High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983, 9:2524 (R;US)
Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983, 9:2681 (R;US)
**Pennsylvania Univ., Philadelphia (USA). Dept. of Physics**
Study of high-energy physics underground. Technical progress report, 9:3172 (R;US)
**Personnel Decisions Research Inst., Minneapolis, MN (USA)**
Utility considerations in emotional stability monitoring for nuclear plant personnel, 9:2200 (R;US)
**Petroleum Training and Technical Services, Norman, OK (USA)**
Maximizing steam-drive recovery in light-oil systems. Final report, 9:1825 (R;US)
**Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1768 (R;US)
**Poitiers Univ., 86 (France)**
Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants, 9:2284 (R;FR;In French)
**Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica**
Hadron spectroscopy, 9:3762 (R;BR;In Portuguese)
**Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)**
Power coefficient anomaly in Joyo, (2). Presumption about the causing mechanism, 9:2395 (R;JP;In Japanese)
Role of Fugen HWR in Japan and design of a 600 MWe demonstration reactor, 9:2275 (R;JP)
**Public Service Co. of New Hampshire, Seabrook (USA)**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2411 (R;US)
**Puerto Rico Univ., Rio Piedras. Dept. of Biology**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3408 (R;US)

## R

**RAND Corp., Santa Monica, CA (USA)**
After energy price decontrol: The role of government conservation programs, 9:2563 (R;US)
**Reaktorinstitut Graz (Austria). Verein zur Foerderung der Anwendung der Kernenergie**
Progress report 1979-1981, 9:2322 (R;AT;In German)
**Regional Health Planning Council, Newark, NJ (USA)**
Radiation therapy plan for Regional Health Planning Council, Newark, New Jersey, 1980. New Jersey Health Service Area 2, 9:3358 (R;US)
**Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)**
Affirmative Action Plan, October 1983 through September 1984, 9:2541 (R;US)
**Rhode Island Univ., Kingston (USA). Dept. of Chemical Engineering**
Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, June 1, 1983-August 31, 1983, 9:1765 (R;US)
**Rice Univ., Houston, TX (USA)**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2084 (R;US)
**Rice Univ., Houston, TX (USA). Dept. of Chemical Engineering**
High P/T phase and volumetric behavior of coal-liquid constituents. Quarterly report, July 1, 1983-September 30, 1983, 9:1792 (R;US)
**Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica**
Equal-time commutation relations for non-abelian gauge field theories and Dirac brackets, 9:4011 (R;BR)
Quantization of gauge invariant theories through the Dirac bracket formalism, 9:4012 (R;BR)
**Rochester Univ., NY (USA). Dept. of Chemistry**
Resonance fluorescence of a two-level atom near a metal surface. Technical report, 9:3511 (R;US)
**Rockefeller Univ., New York (USA)**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3350 (R;US)
**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**
Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982, 9:1936 (R;US)
Electrolyzer for obtaining and refining metals, 9:2717 (TG;US)
**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**
Chemical processing monthly report, 9:1937 (R;US)
Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)
**Rockwell International Corp., Thousand Oaks, CA (USA). Microelectronics Research and Development Center**
Advanced photovoltaic concentrator cells. Final report, August 29, 1979-March 31, 1982, 9:2128 (R;US)
GaAs peeled-film solar cells. Final report, March 15, 1980-December 31, 1981, 9:2129 (R;US)
**Royal Inst. of Tech., Stockholm (Sweden). Electron and Plasma Physics**
Paradigm transition in cosmic plasma physics, 9:3474 (R;SE)
**Royal Inst. of Tech., Stockholm (Sweden). Plasma Physics and Fusion Research**
External magnetic field configurations for EXTRAP, 9:4193 (R;SE)
**Rutherford Appleton Lab., Chilton (UK)**
Atomic structure Hartree-Fock-relativistic and Hartree-XR program-package translated for IBM from the Cowan-CDC version, plus the Zeeman parameter optimisation routines, 9:3543 (R;US)
In vivo imaging of the human thyroid with the Rutherford Positron Camera using (124)L, 9:3383 (R;US)

## S

**Saint Cloud State Univ., MN (USA). Dept. of Chemistry**
Study of selected off-gases produced during the immobilization of nuclear wastes in the SYNROC process. Final report for the year ended December 31, 1982, 9:2006 (R;US)
**Sandia National Labs., Albuquerque, NM (USA)**
Automated 2-D thermal model to predict temperatures in the material stack of a thermal comparator test device, 9:3101 (R;US)
Bremsstrahlung converter debris shields: test and analysis, 9:3157 (R;US)
Cesium-137 gamma-source considerations for dry-sludge irradiators, 9:2072 (R;US)
COBOL programming standards at Sandia Labs, 9:4249 (R;US)
Computer codes for PFN and multi-element log analysis, 9:1914 (R;US)
Core melt/coolant interactions: experiments, 9:2452 (R;US)
Core melt/coolant interactions: modelling, 9:2453 (R;US)
Effects of light and modulation frequency on spin-dependent trapping at silicon grain boundaries, 9:2834 (R;US)
High pressure melt ejection, 9:2455 (R;US)
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1897 (R;US)
High-speed, low-altitude payload delivery using a single large ribbon parachute, 9:3072 (R;US)
Ice-condenser containment loadings during severe accidents, 9:2451 (R;US)
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3215 (R;US)
Interim results of the accident sequence evaluation program (ASEP), 9:2457 (R;US)
Modification of point defects in quartz for device applications, 9:2835 (R;US)
Radiation-enhanced diffusion in ion-implanted glasses and glass/metal couples, 9:3971 (R;US)
Regulation versus reality, 9:1944 (R;US)
Relationship of fire protection research to plant safety, 9:2458 (R;US)

Research on equipment survival in a hydrogen burn, 9:2459 (R;US)
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2456 (R;US)
SARRP: risk rebaselining and risk reduction analysis, 9:2454 (R;US)
Second-order adaptive infinite impulse response filter, 9:3106 (R;US)
Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate, 9:2833 (R;US)
Solar industrial process heat (IPH) project. Technical report, October 1981-September 1982, 9:2146 (R;US)
Some technical issues in geometric modeling, 9:4250 (R;US)
Status report on the ASTM E-42 Committee on Surface Analysis, 9:2904 (R;US)

**Sandia National Labs., Livermore, CA (USA)**
Porosity decrease in laser welds of stainless steel using plasma control, 9:2712 (R;US)

**Sao Carlos Univ. (Brazil). Dept. de Fisica**
Introduction to lattice gauge theories, 9:3835 (R;BR;In Portuguese)

**Sao Paulo Univ. (Brazil). Inst. de Fisica**
Do spin and charge- exchange resonances possess a R(4)-symmetry, 9:3945 (R;BR)
Energetics of the Gamow-Teller resonances, 9:3947 (R;BR)
Large missing-mass clusters in hydrodynamical approach, 9:3628 (R;BR)
Multiple Coulomb excitation effects in heavy ion compound and fusion cross sections, 9:3946 (R;BR)
Optical theorem and forward glory effects in heavy-ion scattering, 9:3948 (R;BR)

**School of Aerospace Medicine, Brooks AFB, TX (USA)**
Antiemetic studies both pre and post exposure: preliminary findings. Preliminary report Jan-Oct 82, 9:3391 (R;US)

**Schweizerisches Inst. fuer Nuklearforschung, Villigen**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3914 (R;US)

**Science Applications, Inc., La Jolla, CA (USA)**
ATR code improvements. Final report 15 Oct-31 Dec 79, 9:3278 (R;US)
Carbonate scaling - literature review and analysis, 9:2170 (R;US)
Reversed field pinch dynamics and transport studies. Quarterly progress report, 20 July 1983-20 October 1983, 9:4049 (R;US)

**Science Applications, Inc., Palo Alto, CA (USA)**
Data Base Management Project. Annual report, 29 September 1982-29 September 1983, 9:2315 (R;US)

**Science Applications, Inc., Schaumburg, IL (USA)**
Nuclear warfare water contamination. Technical report, 9:3333 (R;US)

**Science Research Council, Chilton (UK). Rutherford and Appleton Labs.**
Decay of an electromagnetic wave into an ion-acoustic wave and a Langmuir mode which is heavily damped, 9:4083 (R;GB)
Report on the potential application of the artificial delay line technique as an ultra high precision electronic readout system for channel plate X-ray imaging detectors, 9:3197 (R;GB)

**Science Systems and Applications, Inc., Seabrook, MD (USA)**
Mine waste location by satellite imagery. Open file report 30 May 80-18 Dec 82, 9:1800 (R;US)

**Senat fuer Wissenschaft und Forschung, Berlin (Germany, F.R.)**
Energy research in Berlin. Solar energy utilization by climate-adjusted planning and building, 9:2599 (R;DE;In German)

**Sentralinstitutt for Industriell Forskning, Oslo (Norway)**
Simplified optimization and sensitivity analysis of focusing wave power plants, 9:2183 (R;NO;In Norwegian)

**Shell Switzerland, Zurich**
Switzerland and mineral oil 1981-1982, 9:2565 (R;CH;In German)

**SINTEF, Trondheim (Norway)**
Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2098 (R;NO)

**Societe Nationale ELF-Aquitaine, 75 - Paris (France)**
Experimentation of micro-irrigation by solar pumping: 1979-1981. Final report, 9:2138 (R;XE;FR)
Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2517 (R;XE;FR)

**Solar Energy Research Inst., Golden, CO (USA)**
Aerodynamic sources of acoustic radiation from a single MOD-2 wind turbine, 9:2186 (R;US)
Determination of freeze-protection heat loss from a parabolic trough solar system, 9:2150 (R;US)
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, July 15, 1982-October 14, 1982, 9:2126 (R;US)
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, October 15, 1982-January 14, 1983, 9:2127 (R;US)
New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2966 (TG;US)
Polymeric glazings, 9:2149 (R;US)
Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2182 (R;US)
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2090 (R;US)

**Sonoma Technology, Inc., Santa Rosa, CA (USA)**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3272 (R;US)

**Southern California Edison Co., Rosemead (USA)**
Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach, 9:2190 (R;US)

**Southern Illinois Univ., Carbondale (USA). Coal Extraction and Utilization Research Center**
Development of techniques for obtaining and storing premium coal samples. Annual report 1 Mar-28 Feb 83, 9:1813 (R;US)

**Southwest Research Inst., San Antonio, TX (USA)**
Nonstandard aging tests on coal-derived distillate fuel. Final report, July 7, 1981-July 6, 1983, 9:1766 (R;US)

**Spectrolab, Inc., Sylmar, CA (USA)**
Development of metallization process: FSA Project, cell, and module-formation research area. Quarterly technical progress report No. 6329-15 for the period ending June 30, 1983, 9:2108 (R;US)

**SRI International, Menlo Park, CA (USA)**
High-latitude and equatorial research support for predicting high-altitude nuclear effects. Technical report, 9:3502 (R;US)
Morphology of plasma density irregularities in the auroral f-region. Technical report, 9:3499 (R;US)
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83, 9:2081 (R;US)
Research topics in statistical database management, 9:4263 (R;US)

**Staatliche Materialpruefungsanstalt, Stuttgart (Germany, F.R.)**
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2707 (R;DE;In German)

**Stanford Linear Accelerator Center, CA (USA)**
Factorization and other novel effects in QCD, 9:3778 (R;US)
First results from MARK III at SPEAR. MARK III collaboration, 9:3715 (R;US)
Linearity and resolution of photodiodes, 9:3200 (R;US)
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3777 (R;US)
Quantum chromodynamics in few-nucleon systems, 9:3779 (R;US)
Quark flavor identification in electron-positron annihilation, 9:3713 (R;US)
Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3714 (R;US)
SLAC 5045 klystron (Engineering Materials), 9:3125 (E;US)
SLAC beam scraper (and mask) for MK1 kicker magnet SPEAR 4S5 and 14S15 (Engineering Materials), 9:3166 (E;US)
Status of the IEEE P896 Future Backplane Bus, 9:3199 (R;US)
Test of lead glass shower counters, 9:3198 (R;US)

**Stanford Univ., CA (USA)**
First results from MARK III at SPEAR. MARK III collaboration, 9:3715 (R;US)
Materials for high-temperature thermoelectric conversion, 9:2124 (R;US)
Quantum chromodynamics in few-nucleon systems, 9:3779 (R;US)

**Statens Naturvaardsverk, Solna (Sweden)**
Systems for testing and hazard evaluation of chemicals in the aquatic environment - ESTHER. A background paper and a programme outline as a basis for the research plan in preparation, 9:3332 (R;SE)
**Statens Raad foer Byggnadsforskning, Stockholm (Sweden)**
Air infiltration control in housing. A guide to International Practice, 9:2598 (R;SE)
**Statens Vattenfallsverk, Vaellingby (Sweden). Projekt KOL-HAELSA-MILJOE**
Effect of arsenic on the system, 9:3413 (R;SE;In Swedish)
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3415 (R;SE)
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3412 (R;SE;In Swedish)
Respiratory effects of air pollutants, 9:3416 (R;SE;In Swedish)
Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review, 9:3414 (R;SE;In Swedish)
**State Univ. of New York, Binghamton (USA). Dept. of Chemistry**
Desulfurization with transition metal catalysts, 9:1764 (R;US)
**State Univ. of New York, Buffalo (USA)**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1763 (R;US)
**State Univ. of New York, Stony Brook (USA). Dept. of Chemistry**
Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2977 (R;US)
**Statistics Canada, Ottawa, Ontario**
Research topics in statistical database management, 9:4263 (R;US)
**Strasbourg-1 Univ., 67 (France)**
Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2106 (R;FR;In French)
**Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires**
Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2106 (R;FR;In French)
Study of the operation of migration chambers for detection with the SPES III spectrometer, 9:3171 (R;FR;In French)
**Studsvik Energiteknik AB, Nykoeping (Sweden)**
Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2663 (R;SE;In Swedish)
**Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme**
Analysis of the energy-political paths of the Enquete Commission, 9:2540 (R;DE;In German)
**Sveriges Geologiska Undersoekning, Uppsala**
Energigeologi - exempel pa verksamhet inom energisektorn vid sgu (energy geology - examples of activity in the energy sector within the Swedish geological survey), 9:3436 (R;US)
**Sydney Univ. (Australia). School of Physics**
Wills Plasma Physics Department annual progress report 1982, 9:4062 (R;AU)
**Systems Control, Inc., Burlington, MA (USA)**
Large-scale-system effectiveness analysis, 9:2567 (R;US)

## T

**Technion-Israel Inst. of Tech., Haifa. Dept. of Mechanical Engineering**
Fluidized combustion of oil shale. Final report, 9:1910 (R;US)
**Technische Hochschule Aachen (Germany, F.R.)**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2252 (R;DE;In German)
Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2441 (R;DE;In German)
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1930 (R;DE;In German)
Optimization of a combustion motor driven heat pump (gas/oil) for power ranges up to 20kW thermal with variable sources of environmental energy in one- and two-family-houses (small heat pump), 9:2617 (R;XE;GE)
**Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen**
Reduction gas and artificial gas from Rhine crude lignite by application of tube furnace gas generator, 9:1774 (R;DE;In German)
**Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen**
Design of compression heat pumps driven by diesel engines for domestic heating systems, 9:2621 (R;DE;In German)
Heat technological investigations on plastic heat exchangers for dry type natural draught cooling towers, 9:2194 (R;DE;In German)
Methanol-dual fuel operation of diesel engines with direct injection, 9:2669 (R;DE;In German)
**Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet**
Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2917 (R;DE;In German)
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3042 (R;DE;In German)
Reduction of nitrogen monoxide by catalytically activated lignite coke, 9:1798 (R;DE;In German)
**Technischer Ueberwachungs-Verein Bayern e.V., Muenchen (Germany, F.R.). Inst. fuer Biomedizin und Ergonomie**
Improvements and standardization of communication means for control room personnel in nuclear power plants, 9:2344 (R;DE;In German)
**Technischer Ueberwachungs-Verein Rheinland e.V., Koeln (Germany, F.R.). Inst. fuer Unfallforschung**
Improvements and standardization of communication means for control room personnel in nuclear power plants, 9:2344 (R;DE;In German)
**Technische Univ. Berlin (Germany, F.R.). Fachbereich Verfahrenstechnik**
Desulfurization of hot reductive gases by means of metal oxides, 9:1773 (R;DE;In German)
**Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik**
Economic utilization of geothermal energy, 9:2167 (R;DE;In German)
**Technische Univ. Clausthal, Clausthal-Zellerfeld (Germany, F.R.). Fakultaet fuer Natur- und Geisteswissenschaften**
Spectroscopic investigations of uranium(V) complexes with the coordination number six and eight, 9:3040 (R;DE;In German)
**Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Maschinenwesen**
Theoretical and experimental investigations on dust separation in assemblies of perforated metal sheets, 9:3111 (R;DE;In German)
**Tekniska Hoegskolan, Lund (Sweden). Fysiska Institutionen**
Broadband rotational CARS spectra of simple gases of interest in combustion diagnostics, 9:3055 (R;SE)
Progress Report 1980-81-82, 9:3056 (R;SE)
**Tekniska Hoegskolan, Lund (Sweden). Institutionen foer Vaerme- och Kraftteknik**
Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks, 9:2549 (R;SE;In Swedish)
**Tel Aviv Univ. (Israel)**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3914 (R;US)
Prospects for further unification, 9:3827 (R;US)
**Tel Aviv Univ. (Israel). Dept. of Physics**
Approach to real-time holography, 9:4252 (R;US)
**Tennessee Univ., Knoxville (USA). Dept. of Animal Science**
Structure activity relationships: their function in biological prediction, 9:3409 (R;US)
**Tennessee Valley Authority, Knoxville (USA)**
Tennessee Valley water resources: a strategy for the 1980s and beyond, 9:2546 (R;US)
**Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology**
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1804 (R;US)

**TERA, Inc., Arlington, VA (USA)**
Overview of the Wharton School assessments of the short-term integrated forecasting system (STIFS), 9:2538 (R;US)
**Tetra Tech, Inc., Lafayette, CA (USA)**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3290 (R;US)
**Texas A and M Univ., College Station (USA). Dept. of Mechanical Engineering**
Thermal systems for conversion of municipal solid waste. Volume 2. Mass burning of solid waste in large-scale combustors: a technology status report, 9:2659 (R;US)
**Texas A and M Univ., College Station (USA). Research Foundation**
Large-scale-system effectiveness analysis, 9:2569 (R;US)
**Texas Agricultural Experiment Station, College Station (USA)**
Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82, 9:1857 (R;US)
**Texas Univ., Austin (USA)**
History and ritual events on a Petexbatun Classic Maya polychrome vessel, 9:4236 (R;US)
Research in experimental nuclear physics. Progress report, 1 April 1983-31 March 1984, 9:3862 (R;US)
**Texas Univ., Austin (USA). Bureau of Economic Geology**
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1820 (R;US)
**Texas Univ., Austin (USA). Center for Particle Theory**
Fourier optics for the Maxwell field: formalism and applications, 9:4003 (R;US)
Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields, 9:4004 (R;US)
Realization of first order optical systems using thin lenses, 9:4005 (R;US)
Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3740 (R;US)
**Texas Univ., Austin (USA). Dept. of Art History**
Area group: an example of style and paste compositional covariation in Maya pottery, 9:4237 (R;US)
Compositional attribution of non-provenienced Maya polychrome vessels, 9:2889 (R;US)
**Texas Univ., Austin (USA). Dept. of Chemical Engineering**
Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83, 9:1803 (R;US)
**Texas Univ., Austin (USA). Dept. of Petroleum Engineering**
Development of environmentally attractive leachants. Volume 1. A minitest for in situ uranium leaching, 9:1918 (R;US)
**Texas Univ., Austin (USA). Inst. for Fusion Studies**
Beat-wave current drive in a magnetized plasma, 9:4054 (R;US)
Elimination of stochasticity in stellarators, 9:4157 (R;US)
Sustained self-reversal in the reversed field pinch, 9:4156 (R;US)
**Texas Univ., Dallas (USA). Dept. of Physiology**
Influence of chronic exposure to low level pulsed microwave radiation on performance and cognitive behavior. Final report, 9:3430 (R;US)
**Thomson-CSF, 75 - Paris (France)**
Apparatus for isotopic separation using a high-frequency wave and coherent radiation, 9:1923 (TG;US)
**T.I.C. Enterprises, Johnstown, PA (USA)**
Test results of Thermal Ice Cap prototype and final comments. Final report, 9:2645 (R;US)
**Tishman Research Corp., New York (USA)**
Design methodology analysis: design and operational energy studies in a new high-rise office building. Volume 2, 9:2611 (R;US)
**Tohoku Univ., Sendai (Japan). Faculty of Science**
Magnetic form factor measurements in cerium hexaboride, 9:2779 (R;US)
**Toulouse-3 Univ., 31 (France)**
Application of the Monte Carlo method to the study of the response of an organic liquid scintillator irradiated by photons, 9:3174 (R;FR;In French)
**Transnuclear, Inc., White Plains, NY (USA)**
Value/impact of design criteria for cast ductile iron shipping casks, 9:3073 (R;US)
**TRW Energy Development Group, Redondo Beach, CA (USA)**
Coal-fired MHD Combustor Development Project. Phase IIIC. First quarterly technical progress report, 1 July-30 September 1983, 9:2589 (R;US)
Coal-fired MHD combustor development project: Phase IIIA. Final technical report, 9:2588 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report, 9:3082 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report, 9:3083 (R;US)
**Tuebingen Univ. (Germany, F.R.). Fakultaet fuer Chemie und Pharmazie**
Conversion of sewage sludge by anaerobic elimination of the heterofunction, 9:2662 (R;DE;In German)

## U

**UKAEA Atomic Energy Establishment, Winfrith**
Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis, 9:1927 (R;GB)
**UKAEA Atomic Energy Research Establishment, Harwell. Materials Development Div.**
Electrical processes for the treatment of medium-active liquid wastes. Annual progress report, January-December 1982, 9:1945 (R;GB)
**UKAEA Culham Lab., Abingdon**
Calculation of spectrum line emission from plasmas, 9:4042 (R;GB)
Liquid lithium as a coolant for Tokamak fusion reactors, 9:4150 (R;GB)
Models and codes for the plasma edge region, 9:4044 (R;GB)
Predicted behaviour of the pumped limiter of INTOR, 9:4151 (R;GB)
Predicted behaviour of the single-null divertor of INTOR, 9:4148 (R;GB)
Ripple transport in INTOR, 9:4149 (R;GB)
Soft X-ray imaging diagnostic on the HBTX 1A reversed field pinch, 9:4041 (R;GB)
Tokamak disruptions, 9:4043 (R;GB)
**UKAEA Headquarters, London**
Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry, 9:2247 (R;XA)
Split-count technique for failed fuel detection and location, 9:2246 (R;XA)
**UNC Nuclear Industries, Inc., Richland, WA (USA). Decommissioning Programs Dept.**
Evaluation of nuclear facility decommissioning projects. Summary report: North Carolina State University Research and Training Reactor, 9:2394 (R;US)
**United Technologies Corp., South Windsor, CT (USA). Power Systems Div.**
On-site fuel-cell resource conservation in industrial-process applications. Final report, 9:2591 (R;US)
**Universidade Federal Fluminense, Niteroi (Brazil)**
Proceedings of the 1. Latin-American Colloquium of Surface Physics, 9:3984 (R;BR;In Portuguese)
**University of Central Florida, Orlando (USA)**
In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program, 9:2625 (R;US)
**USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC. Div. of Geothermal and Hydropower Technology**
Geothermal Progress Monitor report No. 8. Progress report, 9:2154 (R;US)
**USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of Safeguards and Security**
Semi-annual report on strategic special nuclear material inventory differences, 9:2056 (R;US)
**USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Environmental Compliance**
Environmental compliance guide: guidance manual for Department of Energy compliance with the Endangered Species Act, 9:3326 (R;US)
**USDOE Economic Regulatory Administration, Washington, DC. Office of Fuels Programs**
Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada, 9:2191 (R;US)

**USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels**
Historical overview of US coal exports, 1973-1982, 9:1815 (R;US)
**USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas**
Structure and trends in natural gas wellhead contracts, 9:1882 (R;US)
**USDOE Idaho Operations Office, Idaho Falls**
Description and operation of Haakon School geothermal-heating system, 9:2180 (R;US)
Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report, 9:3294 (R;US)
**USDOE Morgantown Energy Technology Center, WV**
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1888 (R;US)
**USDOE Nevada Operations Office, Las Vegas**
Public hearings panel report: a summary of public concerns regarding the characterization of a repository site in Nevada, 9:1993 (R;US)
**USDOE, Washington, DC**
Moisture and home energy conservation: how to detect, solve and avoid related problems, 9:2608 (R;US)
**Utah Univ., Salt Lake City (USA)**
Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1787 (R;US)
**Utah Univ., Salt Lake City (USA). Dept. of Electrical Engineering**
Biological effects of millimeter-wave irradiation. Final report 15 May 81-30 Jun 82, 9:3429 (R;US)

## V

**Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)**
Energy economical improvement of an oil heating system, 9:2631 (R;FI;In Finnish)
Energy economy of underground spaces and heat storage in bedrock, 9:2632 (R;FI;In Finnish)
Energy efficiency of different modes of goods transport, 9:2639 (R;FI;In Finnish)
Energy efficiency of different modes of person transport, 9:2640 (R;FI;In Finnish)
Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2130 (R;FI;In Finnish)
Energy research in the mechanical forest industry 1980-1982. Summary, 9:2656 (R;FI;In Finnish)
Energy research in the mechanical forest industry 1980-1982. Optimization of veneer drying, 9:2657 (R;FI;In Finnish)
Energy saving in the production processes of the concrete industry, 9:2655 (R;FI;In Finnish)
Flue gas neutralization by adding gaseous ammonia, 9:2658 (R;FI;In Finnish)
Fuel and tyre costs and driving comfort on the surface dressing, 9:2642 (R;FI;In Finnish)
Heat storage in district heating systems, 9:2664 (R;FI;In Finnish)
High pressure hydrogenation of solid fuels, 9:1781 (R;FI;In Finnish)
Intermittent heating of buildings, 9:2633 (R;FI;In Finnish)
Performance of three solar houses, 9:2147 (R;FI;In Finnish)
Propertier of indigenous fuels. Part 3. Readily volatile compounds of peat, 9:1795 (R;FI;In Finnish)
Properties of indigenous fuels. Part 1. Effect of thermal drying on the structure of sod peat, 9:1814 (R;FI;In Finnish)
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples, 9:2099 (R;FI;In Finnish)
Re-refining of industrial spent oils, 9:1858 (R;FI;In Finnish)
Traffic impacts and energy consumption in urban areas, 9:2641 (R;FI;In Finnish)
Transient analysis of the thermal and moisture physical behaviour of building constructions, 9:2634 (R;FI)
**Vanderbilt Univ., Nashville, TN (USA). Dept. of Computer Science**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3517 (R;US)
**Virginia Commonwealth Univ., Richmond (USA). Dept. of Pharmaceutical Chemistry**
Structure activity relationships: their function in biological prediction, 9:3409 (R;US)
**VSE Corp., Oxnard, CA (USA)**
RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2092 (R;US)

## W

**Wake Forest Univ., Winston-Salem, NC (USA). Dept. of Biology**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3408 (R;US)
**Washington Univ., Seattle (USA). Dept. of Physics**
Giant dipole resonances built on excited states, 9:3891 (R;US)
**Washington Univ., Seattle (USA). Inst. for Nuclear Theory**
Dynamics of the soliton bag, 9:3741 (R;US)
**Washington Univ., Seattle (USA). Nuclear Physics Lab.**
Some methods and problems associated with making thick (1 $mg/cm^2$) $^{28\ 29\ 30}$silicon targets, 9:3148 (R;US)
**Washington Univ., St. Louis, MO (USA). Dept. of Chemistry**
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2914 (R;US)
**Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics**
Collective vs atomic models of the hadrons, 9:3782 (R;IL)
Comparative study of the NN$\pi$ system, II. Elastic NN scattering, 9:3780 (R;IL)
Complex Rishon-type unification, 9:3841 (R;IL)
Composite model for quarks and leptons, 9:3842 (R;IL)
Do 't Hooft anomaly equations know about Georgi-Glashow grand unification, 9:3840 (R;IL)
Fractional charge and anomalous commutators, 9:3846 (R;IL)
Glueballs multiquark states and the OZI rules, 9:3781 (R;IL)
Magnetic moments of baryons, 9:3783 (R;IL)
Phenomenology of shape transitions in hot nuclei, 9:3954 (R;IL)
Solitons in the Peierls condensate. I phase solitons, 9:3845 (R;IL)
**Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics**
Breakdown of maximality conjecture in continuous phase transitions, 9:4022 (R;IL)
N = 2 two dimensional Wess-Zumino model on the lattice, 9:3844 (R;IL)
Surface description of QCD with fermionic quark boundaries, 9:3843 (R;IL)
**Westinghouse Electric Corp., East Pittsburgh, PA (USA)**
Project progress report for month ending September 30, 1983, 9:2007 (R;US)
**Westinghouse Electric Corp., Madison, PA (USA)**
Clarity in writing and editing, 9:4239 (R;US)
**Westinghouse Electric Corp., Pensacola, FL (USA). Nuclear Components Div.**
Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes, 9:2281 (R;US)
**Westinghouse Hanford Co., Richland, WA (USA)**
In-reactor creep behavior of selected ferritic alloys, 9:2285 (R;US)
**Wharton (E.F.A.), Inc., Philadelphia, PA (USA)**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2537 (R;US)
**Winter (Steven) Associates, Inc., New York (USA)**
Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes, 9:2612 (R;US)
Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes, 9:2615 (R;US)
Affordable manufactured housing through energy conservation: using the slide rule and modifiers, 9:2613 (R;US)
Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices, 9:2614 (R;US)
**Wisconsin Univ., Kenosha (USA). Biomedical Research Inst.**
Elf (extremely low frequency) communications system ecological monitoring program. The effects of exposing the slime mold

Physarum polycephalum to electromagnetic fields, 9:3431 (R;US)
**Wisconsin Univ., Madison (USA)**
State-to-state unimolecular reaction dynamics. Technical progress report, 9:3005 (R;US)
**Wisconsin Univ., Madison (USA). Dept. of Chemistry**
Excited-state processes of relevance to photoelectrochemistry. Technical report, 9:3004 (R;US)
Photoluminescent properties of n-GaAs electrodes: applications of the dead-layer model to photoelectrochemical cells. Technical report, 9:2105 (R;US)
**Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering**
Core melt/coolant interactions: modelling, 9:2453 (R;US)
**Wuerzburg Univ. (Germany, F.R.). Medizinische Fakultaet**
Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3380 (R;DE;In German)
**Wyoming Univ., Laramie (USA)**
Fundamental investigations of underground coal gasification. Annual report Mar 82-Mar 83, 9:1777 (R;US)

## Y

**Yale Univ., New Haven, CT (USA)**
MWPC data acquisition in the Brookhaven FASTBUS, 9:3168 (R;US)

## Z

**Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)**
Evaluation of neutron flux density and power density with SPN-detectors and micro calorimeters. A comparison, 9:2213 (R;DD)
Location procedure for sound sources in reactor-technical enclosures, 9:2346 (R;DD)
Phase transitions in nuclear matter and consequences for neutron stars, 9:3955 (R;DD)

# PERSONAL AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German; are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes. For publications with multiple authors, an entry is provided for each author. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

## A


**Aarebot, A.,** *See* Grande, O.S., 9:2197
**Abdel-Khalik, S.I.,** *See* Paul, D.D, 9:3090
**Abdou, M.,** *See* Baker, C., 9:4219
**Abdushukurov, D.A.,** Multiwire proportional low-pressure chamber with a high gas gain coefficient, 9:3191 (R;SU;In Russian)
**Abe, Takashi,** *See* Yamaguchi, Seiya, 9:4170
**Abelson, H.F.,** Metal-hydride heat-pump performance studies, 9:2619 (R;US)
**Abey, A.E.,** Mechanical property measurements on Nellis Baseline Sand and Dry CARES Sand, 9:3443 (R;US)
**Abolins, M.,** Neutrino beams at LAMPF II, 9:3154 (RA;US)
**Abraham, B.M.,** *See* Miyano, K., 9:2993
**Abraham, M.M.,** *See* Summers, G.P., 9:2793
**Abrams, G.S.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
*See* Lockyer, N.S., 9:3716
**Abrams, M.J.,** Synthesis and characterization of hexakis(alkyl isocyanide) and hexakis(aryl isocyanide) complexes of technetium(I), 9:3045 (J;US)
**Abrams, P.C.,** *See* Joyce, D.C., 9:3730
**Ackerhalt, J.R.,** Chaos in multiple-photon excitation of molecules, 9:3562 (J;US)
*See* Galbraith, H.W., 9:3550
**Ackerson, B.J.,** *See* Hanley, H.J.M., 9:3605
**Acocella, J.,** Effect of γ radiation on high-water-content glasses, 9:2876 (J;US)
**Acquavella, J.F.,** Melanoma case-control study at the Los Alamos National Laboratory, 9:3395 (J;GB)
**Adachi, Hiromichi,** SCTF Core-I test results. System pressure effects on reflooding phenomena, 9:2438 (R;JP)
**Adair, H.L.,** Preparation and characterization of heavy ion targets, 9:3165 (J;US)
*See* Ramey, D.W., 9:3164
*See* Walker, R.L., 9:2288
**Adair, R.K.,** *See* Larsen, R.C., 9:3616
**Adam, G.,** Some specific features of coherent radiation and particle propagation in crystals, 9:2829 (R;SU;In Russian)
**Adam, S.,** *See* Adam, G., 9:2829
**Adams, C.J.,** *See* Gabites, J.E., 9:3434
**Adams, J.,** *See* Guswa, J.H., 9:3327
**Adams, J.P.,** Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4, 9:2445 (R;US)
**Adiasor, M.,** *See* Strehlow, R.A., 9:3057
**Adler, D.M.,** *See* Santschi, P.H., 9:3340
**Advani, S.H.,** Status of technology associated with hydraulic fracture modeling, 9:1892 (RA;US)
**Affleck, I.,** Supersymmetry breaking by instantons, 9:3821 (J;US)
**Agnone, A.,** *See* Zakkay, V., 9:2626
**Aharonian, F.A.,** Origin of low energy antiprotons in cosmic rays, 9:3449 (R;SU)
**Ahl, J.L.,** Complete energy transfer map for $COF_2$ , 9:3584 (J;US)
**Ahlen, S.,** Inclusive D and D/sup/ production in $e^+e^-$ annihilation at 29 GeV, 9:3720 (J;US)
**Ahlfeld, C.E.,** *See* Baumann, N.P., 9:2277
**Ahmed, N.,** Second-order adaptive infinite impulse response filter, 9:3106 (R;US)
**Aiken, J.A.,** *See* Scott, D.A., 9:2265
**Akasofu, S.,** *See* Baker, D.N., 9:3508
**Akben, M.G.,** *See* Sakai, T., 9:2730
**Akerlof, C.,** *See* Ahlen, S., 9:3720
**Akhababyan, N.,** *See* Angelov, N., 9:3636
**Akhababyan, N.O.,** *See* Angelov, N.S., 9:3637
**Akiyama, M.,** *See* Tasaka, K., 9:3915
**Alaealmi, M.,** Energy saving in the production processes of the concrete industry, 9:2655 (R;FI;In Finnish)
**Alam, M.S.,** Observation of baryons in B-meson decay, 9:3719 (J;US)
*See* Chen, A., 9:3736
*See* Franklin, M.E.B., 9:3726
**Alamanos, N.,** Demonstration of a large deformation in the first stage of the sequence reaction $^{12}C(^{28}Si,\alpha\alpha)^{28}S$(g.s.) by analysis of angular correlation measurements, 9:3889 (R;FR;In French)
**Alario, J.,** High temperature active heat exchanger research for latent heat storage, 9:2520 (R;US)
**Albal, R.,** Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1768 (R;US)
**Albano, E.V.,** *See* Heras, J.M., 9:2698
**Alberi, G.,** Deuteron D-wave and the non-eikonal effects in tensor asymmetries in elastic proton-deuteron scattering, 9:3746 (R;XA)
**Albrecht, E.,** Workshop on safety analysis reports and licensing procedures. Pt. 1 A, 9:2229 (R;DE)
**Albright, J.R.,** *See* Jenkins, C.M., 9:3727
*See* Liu, L.C., 9:3657
**Albrow, M.G.,** Experiments with nuclear beams and targets, 9:3624 (RA;XC)
**Albuquerque, E.L. de,** Light scattering by surface phonons in crystals, 9:3989 (RA;BR)
*See* Silva Carrico, A. da, 9:3986
**Alcaraz, F.C.,** Introduction to lattice gauge theories, 9:3835 (R;BR;In Portuguese)
**Aldaya, V.,** Supergroup extensions: from central charges to quantization through relativistic wave equations, 9:3829 (R;XA)
**Alden, M.,** Broadband rotational CARS spectra of simple gases of interest in combustion diagnostics, 9:3055 (R;SE)
**Aldred, A.T.,** *See* Radousky, H.B., 9:2789
**Aldred, W.,** *See* Tryk, D., 9:2529
**Aleev, A.N.,** Charmed baryon Λsub(c)sup(+) production by approximately 58 GeV neutrons on carbon, 9:3634 (R;SU)
**Aleksakhin, Yu.I.,** Effect of diaphragms on the electron beam stability in an induction linear accelerator, 9:3139 (R;SU;In Russian)
**Aleksandrov, V.S.,** Electron beam formation in the injection point in the adgezator of the electron-ring accelerator prototype, 9:3138 (R;SU;In Russian)
**Aleshin, Yu.D.,** Search for events having six quarks in the final state, 9:3633 (R;SU;In Russian)
**Alesso, H.P.,** *See* Lim, J.J., 9:2503
**Alfven, H.,** Paradigm transition in cosmic plasma physics, 9:3474 (R;SE)
**Alhassid, Y.,** Group theory approach to scattering, 9:3856 (J;US)
*See* Levit, S., 9:3954
**Allan, C.J.,** Review of the dynamic response of self-powered flux detectors in CANDU reactors, 9:3179 (RA;CA)
**Allen, C.,** Project safety reviews: an aid to management, 9:1854 (BA;GB)
**Allen, J.E.,** *See* Johnson, P.C., 9:2918, 9:2919
**Allen, M.D.,** Comments on the note by L.S. Nelson: "unusually high (oxidizer/Pu) ratios in the macro-residues from plutonium droplet combustion", 9:1939 (J;US)

**Allen, M.P.,** Monte Carlo simulation study of the two-dimensional melting mechanism, 9:3993 (J;US)
**Allen, R.C.,** Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3684 (RA;US)
*See* Wang, K.C., 9:3153
**Allen, S.L.,** *See* Turner, W.C., 9:4198
**Allen, T.,** *See* Malm, H.L., 9:3180
**Allender, J.S.,** Gaseous reduction of an alloy oxide, 9:2975 (J;GB)
**Allibert, M.,** *See* Banon, S., 9:2798
**Allinger, J.,** High field superconducting window-frame beam transport magnets, 9:3076 (J;US)
**Allison, C.M.,** Comparisons of the SCDAP computer code with bundle data under severe accident conditions, 9:2410 (R;US)
**Allman, D.W.,** *See* Dolenc, M.R., 9:2171
**Alonso, J.R.,** Advanced medical accelerator design, 9:3135 (J;US)
**Alster, J.,** *See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Altmann, J.,** Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing, 9:1941 (B;DE;In German)
**Alton, G.D.,** Concerning a long-lived ($^3$P/sup e/)He$^-$ state: Lifetime and energy-level measurements of He$^-$, 9:3568 (J;US)
Theoretical considerations associated with the production of negative ions in sputter-type ion sources, 9:3578 (J;US)
**Alvarez, E.,** Entropy from extra dimensions, 9:3479 (J;US)
**Alvarez, R.A.,** *See* Howell, R.H., 9:3132
**Amagishi, Y.,** Conversion of compressional Alfven waves into ion cyclotron waves in inhomogeneous magnetic fields, 9:4065 (R;JP)
**Amdurer, M.,** *See* Santschi, P.H., 9:3340
**Amidei, D.,** *See* Jaros, J.A., 9:3724
*See* Lockyer, N.S., 9:3716
**Amirkhanov, I.V.,** Effect of third order discretized resonances (2$\nu$sub(z)-$\nu$sub(x)=1) upon the movement of particles in cyclic accelerators, 9:3142 (RA;HU;In Russian)
**Anania, G.,** Application of the stellarator expansion for plasma stability studies in stellarators, 9:4112 (J;US)
Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies, 9:4140 (BA;XA)
**Anda, E.V.,** Single atom and-molecules chemisorption on solid surfaces, 9:3985 (RA;BR;In Portuguese)
*See* Majlis, N., 9:3984
**Andersen, R.A.,** Fischer-Tropsch catalysis. Annual report 1 Jun 81-31 May 82, 9:2082 (R;US)
**Andersen, S.,** Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2077 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.1: Resources, 9:2111 (R;NO;In Norwegian)
**Anderson, A.B.,** LARC: computer codes for Lagrangian analysis of stress-gauge data to obtain decomposition rates through correlation to thermodynamic variables, 9:3228 (R;US)
**Anderson, A.C.,** *See* Dobbs, J.N., 9:2809
*See* Hsieh, T.C., 9:2881
**Anderson, B.C.,** *See* Mayberry, J.L., 9:2038
**Anderson, G.D.,** *See* Abey, A.E., 9:3443
**Anderson, G.L.,** *See* Hill, A.H., 9:1779
**Anderson, H.E.,** Burnout of large-sized woody fuels, 9:3053 (RA;US)
**Anderson, J.A.,** *See* Richards, L.W., 9:3272
**Anderson, J.E.,** Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3321 (RA;US)
*See* Cole, N., 9:3317
*See* Floyd, D.A., 9:3282, 9:3284, 9:3308
*See* Johnson, R.D., 9:3318
*See* Marlette, G.M., 9:3283
*See* Wilkosz, R.J., 9:3309
**Anderson, J.L.,** Tritium handling requirements and development for fusion, 9:4165 (RA;XA)
**Anderson, K.W.,** *See* Wilbur, D.S., 9:3048
**Anderson, R.C.,** *See* Bame, S.J., 9:3506
**Anderson, R.L.,** *See* Canright, G.S., 9:3223
**Andersson, B.,** Aggregation of U.S. population centers into climate regions, 9:2102 (BA;US)
**Andersson, S.,** Heat storage in rock: Multiple well system, 9:2518 (R;US)
**Andrade, B.R.,** *See* Lopez, C.F., 9:2398
**Andre, M.,** *See* Brechignac, F., 9:3384
**Andres, H.,** IAEA code and safety guides on licensing, 9:2306 (R;DE)
**Andrews, M.G.,** Reliability breeds standardization in Combustion Engineering's fuel design, 9:2233 (J;US)
**Angelini, P.,** *See* Stinton, D.P., 9:2045
**Angelov, N.,** Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$N and $\pi^-$C interactions at 40 GeV/c in different reference frames, 9:3636 (R;SU;In Russian)
**Angelov, N.S.,** Change of space-time characteristics of radiation region of secondary $\pi^-$-mesons produced in pion-nucleon interactions at 40 GeV/c on reference frame, 9:3637 (R;SU;In Russian)
**Aniola-Jedrzejek, L.,** *See* Roach, P.R., 9:3608
**Ankenbrandt, C.,** Precise measurement of the $\Sigma^+$ magnetic moment, 9:3729 (J;US)
**Ankeny, D.C.,** *See* Holt, J.B., 9:2766, 9:2771
**Anspaugh, L.R.,** *See* Ng, Y.C., 9:1827
**Antonio, M.R.,** Iron and molybdenum extended X-ray absorption fine structure studies of double-cubane clusters containing $MoFe_3S_4$ cores, 9:2942 (J;US)
**Antonsen, T.M. Jr.,** *See* Berk, H.L., 9:4135
**Antreasyan, D.,** *See* Edwards, C., 9:3728
**Anuta, M.A.,** Mine waste location by satellite imagery. Open file report 30 May 80-18 Dec 82, 9:1800 (R;US)
**Aoyama, M.,** Conceptual design of a fuel assembly for extended operational cycle length in LWRs, 9:2214 (J;US)
**Apel, W.D.,** *See* D'Agostini, G., 9:3625
**Apfel, R.E.,** Instrument to detect vapor nucleation of superheated drops, 9:3203 (J;US)
**Appleton, B.R.,** Ion channeling techniques for defect and surface studies, 9:3977 (BA;NL)
*See* Stritzker, B., 9:2750
**Ara, K.,** *See* Wakayama, N., 9:2386
**Araki, Yasusuke,** *See* Mishima, Kaichiro, 9:2391
**Araujo, H.,** *See* Nguyen, H., 9:1825
**Araya, J.,** *See* Moncada, G., 9:2699
**Araya, J.A.,** Curie temperature in Nickel thin films, 9:2704 (RA;BR;In Spanish)
**Arbuzov, V.A.,** Eigenvalue problem in the QCD simulating theory, 9:3757 (R;SU)
**Arcuri, K.B.,** Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:3001 (D;US)
**Arefiev, V.A.,** *See* Aleev, A.N., 9:3634
**Arendt, F.,** Superconducting magnet safety, 9:4168 (RA;XA)
**Argento, A.,** Electroweak asymmetry in deep inelastic muon-nucleon scattering, 9:3635 (R;SU)
**Arkhipov, V.V.,** Differential cross section of eta meson production on carbon by $\pi^-$ mesons at the momentum of 3.3 GeV/c, 9:3638 (R;SU;In Russian)
**Armaganyan, A.A.,** *See* Avakyan, R.O., 9:2822
**Armstrong, W.T.,** *See* Siemon, R.E., 9:4137
**Arnold, G.W.,** Radiation-enhanced diffusion in ion-implanted glasses and glass/metal couples, 9:3971 (R;US)
**Arnold, J.R.,** *See* Reedy, R.C., 9:3451
**Arthur, M.A.,** Thermal history of the Georges Bank Basin, 9:2159 (R;US)
**Arthur, W.J.,** Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3295 (RA;US)
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3298 (RA;US)
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3285 (RA;US)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3288 (RA;US)
*See* Reynolds, T.D., 9:1947
**Artozoul, M.,** Wigner effect in graphite stack: G2 and G3 reactors, 9:2820 (R;FR;In French)
**Arunkumar, K.A.,** Theory of surface enhanced Raman scattering, 9:3589 (J;US)
**Arutyunyan, L.G.,** *See* Avakyan, R.O., 9:2822
**Asatryan, G.M.,** T quark mass in the SO-(10) symmetry, 9:3816 (RA;SU;In Russian)
**Asatryan, H.M.,** Discrete symmetries in SO(N) grand unified groups and the survival hypothesis, 9:3795 (R;SU)
**Asay, J.R.,** *See* Brannon, P.J., 9:2833
**Asbridge, J.R.,** *See* Bame, S.J., 9:3506
**Asbury, J.G.,** Assessment of cool storage in commercial building applications, 9:2620 (R;US)
**Ashby, D.E.T.F.,** Ripple transport in INTOR, 9:4149 (R;GB)
**Ashcroft, D.L.,** *See* Schilling, G., 9:4145
**Aslanides, E.,** Study of the operation of migration chambers for detection with the SPES III spectrometer, 9:3171 (R;FR;In French)
**Astvatsaturov, R.G.,** *See* Arkhipov, V.V., 9:3638
**Atencio, L.G.,** *See* Idzorek, G.C., 9:3104

**Atkin, S.D.,** *See* Panayotou, N.F., 9:3094
**Atkins, D.F.,** Producibility studies using UAl/sub x/ for low enrichment fuel plates, 9:2360 (RA;US)
**Atkins, L.A.,** *See* Stewart, B.M., 9:1801
**Attalla, A.,** Quantitative determination of hydrogen by pulsed nuclear magnetic resonance spectroscopy, 9:2901 (R;US)
**Attenberger, S.E.,** *See* Hastings, D.E., 9:4080
**Atwood, C.L.,** *See* Steverson, J.A., 9:2505
**Audouard, A.,** Low temperature irradiation effects on iron-boron based amorphous metallic alloys, 9:2679 (R;FR;In French)
**Auer, F.,** *See* Ball, D.A., 9:2629
**Auerbach, E.H.,** Hypernuclear spectroscopy in the p shell, 9:3793 (J;US)
**Auffahrt, J.,** Catalytic-kinetic micro trace determination of fluoride in environmental matrixes, 9:2902 (R;DE;In German)
**Augustine, M.,** *See* Jenkins, D., 9:2269
**Augustson, R.H.,** IAEA experience with authentication of in-plant NDA instrumentation, 9:2061 (BA;XA)
**Avakyan, A.P.,** Phenomenon of the minimum of radiation energy losses of relativistic electrons in the crystal, 9:3965 (R;SU;In Russian)
**Avakyan, R.O.,** Fine structure in the orientational dependence of the total yield of superfast electrons from a diamond crystal, 9:2822 (R;SU;In Russian)
**Avdyushin, S.I.,** Prediction and identification of cosmic solar radiation flux and spectra, 9:3459 (R;US)
**Avenier, M.,** Weak nucleon-nucleon interaction in few body systems, 9:3867 (R;FR)
**Averback, R.S.,** Kinetics of radiation-induced segregation in Ni—12.7 at. % Si, 9:2725 (J;US)
**Averill, B.A.,** *See* Antonio, M.R., 9:2942
**Avery, P.,** Production of charmed mesons in $e^+e^-$ annihilation at 10.5 GeV, 9:3718 (J;US)
**Awaji, N.,** *See* Kawabata, S., 9:3198
**Awschalom, M.,** *See* Ten Haken, R.K., 9:3982
**Aydemir, A.Y.,** Sustained self-reversal in the reversed field pinch, 9:4156 (R;US)
**Azcarraga, J.A. de,** *See* Aldaya, V., 9:3829
**Azhinenko, I.V.,** Energy and quantum number fluxes in $K^+p$ and $\pi^+p$ interactions at 32 and 70 GeV/c, 9:3629 (R;SU;In Russian)
**Azimov, Ya.I.,** Tau lepton in 1980, 9:3765 (RA;SU;In Russian)

## B

**Baaquie, B.E.,** New solution for the Schwinger model, 9:3828 (R;XA)
**Baars, H.G.,** Tomographic and scintigraphic examinations of the autologic spongiosa transplantat of the infective pseudoarthrosis, 9:3362 (RA;HU;In Hungarian, English)
**Baars, R.E.,** Calibration and qualification of the Los Alamos failure model, 9:2468 (J;US)
**Babchin, A.J.,** Nonlinear saturation of Rayleigh—Taylor instability in thin films, 9:3991 (J;US)
**Babu, G.N.,** Radiolysis of resist polymers. IV. Poly(p-substituted-alpha-methylstyrenes). Technical report, 9:3030 (R;US)
**Back, T.,** *See* Forsgren, M., 9:2189
**Baden, A.R.,** *See* Lockyer, N.S., 9:3716
**Baer, H.G.,** *See* Zeidler, G., 9:1881
**Baer, H.W.,** *See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Baer, R.L.,** Conical transducer for generation of acoustic waves in fluids, 9:3080 (J;US)
**Baer, T.,** *See* Butler, J.J., 9:2987
**Baer, W.,** Projected occupational exposures during WIPP operations, 9:2008 (J;US)
**Baez, J.N.,** *See* Volman de Tanis, S., 9:2313
**Bagchi, A.,** *See* Barrera, R.G., 9:2702
**Bahethi, O.P.,** *See* Anuta, M.A., 9:1800
**Bailey, R.B.,** *See* Janssens, J.H., 9:2134
**Bailey, V.L.,** Intense relativistic electron beam injector system for tokamak current drive, 9:4204 (J;US)
**Bain, A.S.,** Transfer of science, education, and basic nuclear technology, 9:2481 (J;US)
**Baity, F.W.,** Plasma properties and ion heating in EBT-S and hot electron rings at TRW, 9:4136 (BA;XA)
*See* Hiroe, S., 9:4082
**Bak, P.,** *See* Houlrik, J.M., 9:3992
**Bakac, A.,** *See* McDowell, M.S., 9:3027
**Bakalov, D.D.,** $\mu$-capture in a liquid hydrogen, 9:3639 (R;SU;In Russian)
**Baker, C.,** First wall and blanket engineering development for magnetic fusion reactors, 9:4219 (BA;XA)
**Baker, D.F.,** The thermal expansion of the directionally solidified Al-$CuAl_2$ eutectic, 9:2759 (J;NL)
**Baker, D.N.,** ISEE 3 high time resolution study of interplanetary parameter correlations with magnetospheric activity, 9:3508 (J;US)
*See* Bame, S.J., 9:3506
*See* Nagai, T., 9:3505
**Baker, J.,** *See* Koopman, R.P., 9:1885
**Baker, N.J.,** Measurement of the $\nu$/sub $\mu$/ charged-current cross section, 9:3731 (J;US)
**Baker, S.P.,** Wide-range vortex shedding flowmeter for high-temperature helium gas, 9:2282 (R;US)
**Balaes, A.M.E.,** Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2897 (R;ZA)
Installation and commissioning of a Siemens SRS200 sequential X-ray-fluorescence spectrometer, 9:3214 (R;ZA)
*See* Jacobs, J.J., 9:2898
**Balandin, M.P.,** Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3538 (R;SU;In Russian)
**Balandin, V.P.,** *See* Aleev, A.N., 9:3634
**Balantekin, A.B.,** Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3882 (J;US)
**Baldo-Ceolin, M.,** Neutron-antineutron oscillations from an experimental point of view, 9:3630 (RA;HU)
**Baldwin, D.E.,** *See* Berk, H.L., 9:4135
**Baldwin, M.N.,** *See* Newman, L.W., 9:2223
**Baleynaud, P.,** Legal regime for the nuclear electricity-generating policy in France, 9:4275 (B;FR;In French)
**Ball, D.A.,** State-of-the-art survey of existing knowledge for the design of ground-source heat pumps, 9:2629 (R;US)
**Ball, D.G.,** *See* Cheverton, R.D., 9:2404
**Ball, L.J.,** *See* Connelly, J.W., 9:3325, 9:3347
*See* Knick, S.T., 9:3346
**Ball, R.C.,** Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3733 (J;US)
**Ballagh, H.C.,** *See* Taylor, G.N., 9:3732
**Balleux, W.,** *See* Voorde, N. van de, 9:1955
**Baltay, C.,** *See* Baker, N.J., 9:3731
**Baltz, A.J.,** *See* Auerbach, E.H., 9:3793
**Bame, S.J.,** Plasma regimes in the deep geomagnetic tail: ISEE 3, 9:3506 (J;US)
*See* Baker, D.N., 9:3508
*See* Hones, E.W. Jr., 9:3509
*See* Sckopke, N., 9:3507
**Banaschek, J.,** Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2252 (R;DE;In German)
**Banba, Tsunetaka,** Simulated HLLW compositions for cold test of waste management development, 9:1992 (R;JP)
**Band, Y.B.,** *See* Ondrechen, M.J., 9:3124
**Bandy, R.,** Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water, 9:2221 (R;US)
**Bangart, R.L.,** Need for revising US Nuclear Regulatory Commission Regulatory Guide 1.52 in light of NRC-sponsored research program results and other developments, 9:2206 (RA;XA)
**Bankhead, C.C. Jr.,** Processing of geological and engineering data in multipay fields for evaluation, 9:1874 (RA;US)
**Banon, S.,** Investigation of the evaporation thermodynamics and stationary states (so-called "congruent states") in the study of oxides and their mixtures by the effusion method--application to $Al_2O_3$, CaO, and the mixtures $Al_2O_3$-CaO and $Ti_2O_3$-$TiO_2$, 9:2798 (J;US)
**Banovetz, L.M.,** *See* Williams, J.M., 9:2819
**Banzoli, V.,** Automated underwater wellhead, 9:1845 (BA;GB)
*See* Sebastiani, G., 9:1867
**Barabash, L.S.,** Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3188 (R;SU;In Russian)
**Baranko, G.,** *See* Ahlen, S., 9:3720
**Baranov, A.M.,** *See* Barabash, L.S., 9:3188

**Baranov, V.A.,** Design logic and modelling of RASTR special processor for C-detector of ARES spectrometer, 9:3187 (R;SU;In Russian)
**Barbiellini, G.,** Search for massive neutrinos, axions and SUSY particles at CERN SPS energies, 9:3622 (RA;XC)
**Barbier, Y.,** Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1860 (BA;GB)
**Bard, F.E.,** Fuel pin cladding transient failure strain criterion, 9:2289 (J;US)
**Bargholtz, C.,** *See* Tegner, P.E., 9:3480
**Barhorst, J.F.,** *See* Larson, B.C., 9:2884
**Baringer, P.,** *See* Ahlen, S., 9:3720
**Barkai, D.,** Monte Carlo studies of Wilson loops in SU(5) gauge theory in four dimensions, 9:3850 (J;US)
**Barker, R.B.,** Strategic threat, 9:3240 (RA;US)
**Barker, R.J.,** *See* Cooperstein, G., 9:4228
**Barlow, D.,** *See* Saha, A., 9:3734
**Barnard, R.W.,** Computer codes for PFN and multi-element log analysis, 9:1914 (R;US)
**Barnes, D.C.,** *See* Aydemir, A.Y., 9:4156
**Barnes, P.D.,** Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}O$ and $^{18}O$ at 800 MeV, 9:3877 (RA;US)
Search for a possible strangeness S = -2 dibaryon, 9:3643 (RA;US)
Weak decay of lambda hypernuclei, 9:3645 (RA;US)
**Barnett, R.N.,** Multilayer relaxation of interlayer registry and spacing at high-index metal surfaces, 9:2718 (J;US)
**Barnhart, B.V.,** PETN homolog analysis and large-scale preparation of pure PETN homologs by high-performance liquid chromatography (HPLC), 9:3230 (R;US)
**Baron, J.,** *See* Bremner, W.B., 9:2000
**Barr, W.F.,** *See* Stafford, M.P., 9:3316
**Barr, W.L.,** *See* Carlson, G.A., 9:4213
*See* Moir, R.W., 9:4216
**Barreca, J.R.,** *See* Muhlestein, L.D., 9:4166
**Barrera, R.G.,** Local field effects in the absorbed monoshell reflectance on substrates with spatial dispersion, 9:2702 (RA;BR;In Spanish)
*See* Mochan, L., 9:2826
*See* Mochan, W.L., 9:3994
**Barrett, J.H.,** Ion dechanneling due to lattice strains in semiconductor superlattices, 9:2858 (J;US)
**Barrett, M.F.,** *See* Harvey, C.A., 9:2568
**Barrett, P.H.,** *See* Parker, S.F., 9:2928
**Barrie, J.N.,** *See* Crosthwaite, J.L., 9:1976
**Barron, W.R.,** Using solar radio burst integrated fluxes to predict energetic proton flux increases, 9:3460 (R;US)
**Barrow, R.F.,** *See* Kittrell, C., 9:3580
**Barry, B.J.,** *See* McCabe, W.J., 9:2158
**Barthel, J.R.,** Study of excited state energy transfer processes. Final report 1 Jan 81-31 Dec 82, 9:3512 (R;US)
**Bartlett, J.W.,** Disposal safety. Is consensus necessary, 9:2055 (RA;CA)
**Bartsch, R.R.,** *See* Siemon, R.E., 9:4137
**Basham, S.J. Jr.,** Waste packages for high-level waste repositories, 9:2020 (J;US)
**Bass, H.E.,** Vibrational relaxation of $UF_6$: Ultrasonic measurements in mixtures with CO, 9:2839 (J;US)
**Bass, J.,** *See* Guswa, J.H., 9:3327
**Bass, L.M.,** *See* Jarrold, M.F., 9:3583
**Bastrukov, S.I.,** *See* Solov'ev, V.G., 9:3923
**Batchelor, D.B.,** *See* Hedrick, C.L., 9:4141
*See* Rasmussen, D.A., 9:4045
**Bateman, B.R.,** *See* Way, J.D., 9:1880
**Bateman, J.E.,** In vivo imaging of the human thyroid with the Rutherford Positron Camera using (124)L, 9:3383 (R;US)
Report on the potential application of the artificial delay line technique as an ultra high precision electronic readout system for channel plate X-ray imaging detectors, 9:3197 (R;GB)
**Bathke, C.G.,** ELMO Bumpy Torus fusion reactor design study, 9:4210 (BA;XA)
*See* Miller, R.L., 9:4184
**Batista, J.L.,** Power distribution and fuel depletion calculation for a PWR, using LEOPARD and CITATION codes, 9:2241 (B;BR;In Portuguese)
**Batteen, M.L.,** *See* Pollard, D., 9:3444
**Bauer, J.,** Study on the design basis accident 'aircraft impact on nuclear power plant', 9:2416 (R;DE;In German)
**Bauer, W.,** *See* Wilson, K.L., 9:4223
**Baughcum, S.L.,** *See* Laguna, G.A., 9:3029
**Baukal, W.,** *See* Schimetschka, E., 9:2435
**Baum, G.,** New measurement of deep-inelastic e-p asymmetries, 9:3717 (J;US)
**Baum, J.,** Broadband population inversion by phase modulated pulses, 9:4023 (J;US)
**Baumann, N.P.,** Reactivity monitoring during reactor reloading operations, 9:2277 (J;US)
**Baumann, R.,** *See* Herzog, T., 9:2604
**Baumvol, I.J.R.,** Diffusion assisted by radiation as a surface protection method, 9:2700 (RA;BR;In Portuguese)
Modification of the iron mechanical- and corrosion features by ion implantation in surface, 9:2697 (RA;BR;In Portuguese)
**Bautz, P.,** *See* Altmann, J., 9:1941
**Bawiec, W.J.,** *See* Drew, L.J., 9:1819
**Baxter, A.M.,** *See* Stansfield, O.M., 9:2245
*See* Turner, R.F., 9:2320
**Baybutt, P.,** *See* Denning, R.S., 9:2496
**Beamer, N.V.,** Radwaste incineration at CRNL, 9:1971 (RA;CA)
**Beardsley, G.M.,** *See* Schirber, J.E., 9:2738
**Beattie, W.H.,** *See* Laguna, G.A., 9:3601
*See* Maier, W.B. II, 9:3552
**Beauchamp, J.J.,** *See* Hunsaker, C.T., 9:3331
**Beauchamp, J.L.,** *See* Halle, L.F., 9:2971
**Beauvy, M.,** Physical properties of boron carbide, 9:2777 (R;FR)
**Bebek, C.,** *See* Avery, P., 9:3718
**Beck, J.E.,** *See* Rempel, J.R., 9:3070
**Becker, C.D.,** Acute toxicity of water soluble fractions derived from a coal liquid (SCR-II) to three aquatic organisms, 9:3424 (J;NL)
**Becker, H.,** *See* Cohn, D.R., 9:4207
**Becker, J.A.,** *See* Decman, D.J., 9:3931
**Becker, K.,** National and international standards in nuclear technology transfer, 9:2488 (J;US)
**Becker, S.A.,** Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3458 (R;US)
**Becker, W.G.,** *See* Jones, G. II, 9:3024, 9:3025
**Beckervordersandforth, C.P.,** Reduction gas and artificial gas from Rhine crude lignite by application of tube furnace gas generator, 9:1774 (R;DE;In German)
**Bednar, M.,** Representations of osp(1,4) in terms of three boson pairs and matrices of arbitrary even order. Description of the method, 9:4038 (R;SU)
**Beers, G.H.,** *See* Allison, C.M., 9:2410
**Beers, S.C.,** *See* Matzie, R.A., 9:2235
**Behr, V.L.,** Ice-condenser containment loadings during severe accidents, 9:2451 (R;US)
**Behrens, J.W.,** Neutron transmission measurements to determine isotopic content of spent fuel, 9:2039 (J;US)
**Beiersdorfer, P.,** High-frequency magnetic measurements using small inductive probes, 9:3216 (J;US)
**Beiriger, W.,** *See* Schwartz, L., 9:3258
**Belanger, L.,** *See* Feraday, M.A., 9:2363
**Belen Gavela, M.,** *See* Alvarez, E., 9:3479
**Belen'kii, B.S.,** *See* Roms, Yu.G., 9:2774
**Bell, B.J.,** IREP human reliability analysis, 9:2501 (BA;US)
Overview of a procedure for human reliability analysis, 9:2319 (BA;US)
**Bell, J.,** *See* Santschi, P.H., 9:3340
**Bell, Z.W.,** Neutron-induced gamma-ray production in $^{57}Fe$ for incident neutron energies between 0.16 and 21 MeV, 9:3898 (J;US)
**Belokopytov, Yu.A.,** *See* Azhinenko, I.V., 9:3629
**Belova, T.I.,** Stability regions of one-dimensional solitons of a charged scalar field, 9:3838 (R;SU;In Russian)
**Belsley, M.,** *See* Molander, W., 9:3544
**Beltrami, I.,** *See* Ahlen, S., 9:3720
**Belyakov, V.A.,** Study on the poloidal magnetic fields in the "Tuman-3" device, 9:4187 (R;SU;In Russian)
**Bemis, C.E.,** *See* Dabbs, J.W.T., 9:3942
**Bender, D.,** *See* Ahlen, S., 9:3720
**Benedek, R.,** *See* Sabelli, N.H., 9:2797
**Benenati, R.,** *See* Varljen, T.C., 9:4209
**Benenson, G.,** *See* Black, J.K., 9:3168
**Benjamin, A.S.,** SARRP: risk rebaselining and risk reduction analysis, 9:2454 (R;US)
**Bennett, J.M.,** High-resolution silicon-29 nuclear magnetic resonance and neutron powder diffraction study of Na-A zeolite. Loewenstein's rule vindicated, 9:2934 (J;US)
**Bennett, R.A.,** *See* Wexler, S., 9:3448
**Beno, M.A.,** *See* Williams, J.M., 9:2819
**Benoit, A.,** *See* Molnar, S. von, 9:2799
**Bentley, J.,** Interface structure of some precipitates in austenitic stainless steels, 9:2763 (BA;US)
*See* Lawless, K., 9:2802
*See* Sklad, P.S., 9:2803
**Bentzen, E.H.,** *See* Gibson, G.W., 9:2040
**Benvenuti, A.C.,** *See* Argento, A., 9:3635
**Berant, Z.,** *See* Wohn, F.K., 9:3918

**Berbesson, J.,** Long distance transport of LNG via cryogenic pipeline, 9:1903 (BA;GB)
**Berezhnyj, V.L.,** Far infrared heterodyne laser interferometer, 9:4076 (R;SU;In Russian)
**Berezinskij, V.S.,** Practically stable proton in the SU-5 model, 9:3817 (RA;SU;In Russian)
**Berg, R.S.,** Factors affecting the operating characteristic of the zetatron: a small neutron generator for borehole logging, 9:3130 (J;US)
**Berg, W.W.,** Atmospheric Bromine in the Arctic, 9:3276 (J;US)
**Bergdolt, A.M.,** *See* Aslanides, E., 9:3171
**Bergdolt, G.,** *See* Aslanides, E., 9:3171
**Berge, J.P.,** *See* Ankenbrandt, C., 9:3729
**Bergeron, C.F.,** *See* Warman, E.A., 9:2486
**Berget, G.,** Preparation of carbon 11-labelled radiopharmaceuticals by the use of HPLC method, 9:3356 (R;FR;In French)
**Berghaus, U.F.W.,** Study of the particle unstable S-nucleus resonances $^5$Lisup(3/2-) and $^5$Hesup(3/2-) in the reaction $\alpha+d->\alpha+p+n$ at the c.m. energy Esub(CMS)=9.3 MeV, 9:3866 (R;DE;In German)
**Bergkamp, M.A.,** Lifetimes of the ligand-to-metal charge-transfer excited states of iron(III) and osmium(III) polypyridine complexes. Effects of isotopic substitution and temperature, 9:2925 (J;US)
**Bergstroem, M.R.,** *See* Baum, G., 9:3717
**Beri, A.C.,** First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$, 9:2788 (J;US)
**Berk, H.L.,** Curvature-driven trapped-particle modes in tandem mirrors, 9:4135 (BA;XA)
**Berkelman, K.,** *See* Avery, P., 9:3718
**Berman, B.L.,** *See* Olson, D.L., 9:3883
**Berman, M.,** Core melt/coolant interactions: experiments, 9:2452 (R;US)
Core melt/coolant interactions: modelling, 9:2453 (R;US)
**Bernas, M.,** Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3899 (R;FR)
**Bernfeld, D.,** Formation of hydrogen atoms in pyrolysis of 2,2-dimethylpropane behind shock waves, 9:2984 (J;US)
**Berry, D.A.,** Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82, 9:1859 (R;US)
**Berry, D.L.,** Relationship of fire protection research to plant safety, 9:2458 (R;US)
**Berry, L.A.,** *See* Baity, F.W., 9:4136
*See* Hiroe, S., 9:4082
**Berry, R.S.,** *See* Sala-mon, P., 9:4029
**Berryman, J.G.,** Theory of pulse propagation in fluid-saturated porous layers, 9:4021 (R;US)
**Bersohn, R.,** *See* van Veen, N., 9:2921
**Bertrand, F.E.,** *See* Tinsley, J.R., 9:3933
**Bertsch, G.F.,** Damping of nuclear excitations, 9:3962 (J;US)
**Berven, B.A.,** *See* Myrick, T.E., 9:3303
**Besen, S.M.,** After energy price decontrol: The role of government conservation programs, 9:2563 (R;US)
**Besnard, D.,** Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment, 9:4147 (R;FR;In French)
**Best, L.B.,** *See* Petersen, K.L., 9:3313
*See* Winter, B.M., 9:3312
**Bethe, H.A.,** Simplified equation of state near nuclear density, 9:3960 (J;NL)
**Beuhler, R.J.,** *See* Friedman, L., 9:3576
**Bevensee, R.M.,** Maximum entropy reconstruction of a volume anomaly from pulse scatter data, 9:3102 (R;US)
**Bhalerao, R.S.,** *See* Rinat, A.S., 9:3780
**Bhargava, R.N.,** *See* Goldman, A.I., 9:2844
**Bhatia, T.S.,** Elastic $K^+N$ scattering, 9:3676 (RA;US)
Nucleon-nucleon scattering above LAMPF energies, 9:3671 (RA;US)
Pion spectroscopy at LAMPF II: possibilities for EPICS II, 9:3152 (RA;US)
**Bhattacharjee, A.,** Magnetic reconnection driven by the coalescence instability, 9:4095 (J;US)
**Biancheria, A.,** Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2297 (J;US)
**Bibb, W.F.,** *See* Orrison, L.H., 9:3386
**Biefeld, R.M.,** *See* Picraux, S.T., 9:2836
**Biel, J.,** *See* McLaughlin, M., 9:3725
**Bienlein, J.K.,** Gluon fragmentation in T(1S) decays, 9:3626 (R;DE)
**Bieri, J.M.,** *See* Taylor, G.W., 9:2259
**Bigeleisen, J.,** Feed cycles for the industrial production of heavy water through multiphoton dissociation of fluoroform, 9:2069 (J;US)
**Bigelow, J.E.,** *See* Walker, R.L., 9:2288
**Biggs, A.,** *See* Bremner, W.B., 9:2000
**Bighel, L.,** *See* Baity, F.W., 9:4136
**Bilello, J.C.,** Surface energy of zinc, 9:2729 (J;US)
**Biljetina, R.,** Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82, 9:2080 (R;US)
**Billen, J.H.,** *See* Bullen, D.B., 9:2731
**Billings, M.P.,** Leak-rate qualification of the FFTF control area, 9:2343 (R;US)
**Billone, M.C.,** *See* Hsieh, T.C., 9:2370
**Bilson, E.,** *See* Gold, T., 9:1877
**Bincer, A.M.,** Eigenvalues of Casimir operators for the general linear and orthosymplectic Lie superalgebras, 9:4039 (J;US)
**Bing, O.,** *See* Aslanides, E., 9:3171
**Bingham, G.E.,** Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2906 (J;US)
**Bingham, H.H.,** *See* Taylor, G.N., 9:3732
**Bingham, R.,** Decay of an electromagnetic wave into an ion-acoustic wave and a Langmuir mode which is heavily damped, 9:4083 (R;GB)
**Binkley, J.S.,** *See* Oie, T., 9:2972
**Birgeneau, R.J.,** *See* Hagen, M., 9:2860
**Birkelund, J.R.,** *See* Breuer, H., 9:3897
**Birkhoff, G.,** *See* Bremner, W.B., 9:2000
**Birn, J.,** *See* Hones, E.W. Jr., 9:3509
*See* Mozer, F.S., 9:3510
**Birse, R.D.,** Process of designing effective training courses and programs, 9:2274 (RA;CA)
**Bishop, R.L.,** Area group: an example of style and paste compositional covariation in Maya pottery, 9:4237 (R;US)
Compositional attribution of non-provenienced Maya polychrome vessels, 9:2889 (R;US)
*See* Reents, D.J., 9:4236
**Biswas, D.R.,** Effect of surface treatments on strength of PZT polycrystalline ceramics, 9:2806 (J;GB)
**Bitter, M.,** *See* Hwang, D., 9:4131
**Bjoerk, S.,** *See* Hoerjel, N., 9:2437
**Black, J.K.,** MWPC data acquisition in the Brookhaven FASTBUS, 9:3168 (R;US)
**Blackman, G.S.,** *See* Williams, J.M., 9:2819
**Blackwell, C.S.,** *See* Bennett, J.M., 9:2934
**Blair, T.R.,** Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2201 (R;US)
**Blais, N.C.,** Improved parametrization of diatomics-in-molecules potential energy surface for $Na(3p\ ^2P)+H_2 \rightarrow Na(3s\ ^2S)+H_2$, 9:2959 (J;US)
**Blanckenburg, J.F.G.,** *See* Lamain, L.G., 9:2676
**Bland, L.C.,** Double-charge-exchange reactions, 9:3878 (RA;US)
**Bland, R.W.,** *See* Joyce, D.C., 9:3730
**Blank, J.,** *See* Bednar, M., 9:4038
**Blankenship, D.M.,** *See* Rille, E., 9:3599
**Blann, M.,** Global test of modified precompound decay models, 9:3930 (J;US)
Precompound analyses of spectra and yields following nuclear capture of stopped $\pi^-$, 9:3884 (J;US)
*See* Castaneda, C.M., 9:3894
**Blatt, S.R.,** *See* Black, J.K., 9:3168
**Blaszynski, M.,** *See* Alberi, G., 9:3746
**Blevins, J.D.,** *See* Palen, A.H., 9:2428
**Bliem, C.J. Jr.,** Raft River 5MW(e) binary geothermal-electric power plant: operation and performance, 9:2169 (R;US)
**Blinkin, V.L.,** Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core, 9:2325 (R;SU;In Russian)
**Blocker, C.A.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
*See* Lockyer, N.S., 9:3716
**Blockus, D.,** *See* Ahlen, S., 9:3720
**Blom, S.,** *See* Lagerkvist, B., 9:3413
**Blondel, A.,** *See* Franklin, M.E.B., 9:3726
**Bloom, G.R.,** Hydrogen mixing in compartments with a high-velocity source, 9:2415 (R;US)
**Bloom, S.D.,** *See* Mathews, G.J., 9:3919
**Bloomquist, D.D.,** Optically recording interferometer for velocity measurements with subnanosecond resolution, 9:3222 (J;US)
**Bloss, W.H.,** Integrated thin film solar cell generators with higher output voltages, 9:2109 (R;XE)
**Bluhm, H.,** Research progress in intense ion beam production for inertial confinement fusion at Cornell University, 9:4229 (BA;XA)
**Blume, H.T.,** *See* Fernandez, E., 9:3723
**Blumenfeld, Y.,** Projectile fragmentation and light particle emission from 70

MeV/nucleon α particles on $^{197}Au$, 9:3925 (R;FR)
**Blumenthal, D.L.,** *See* Richards, L.W., 9:3272
**Bocharova, I.E.,** Application of polynomial expansions for calculating neutron transport through spherical regions with cavities, 9:2324 (R;SU;In Russian)
**Bodas, E.L. de,** Charged particle interaction with the oscillation modes of a surface, 9:3533 (RA;BR;In Portuguese)
**Bodwin, G.T.,** *See* Brodsky, S.J., 9:3777
**Boehm, B.,** *See* Schimetschka, E., 9:2417, 9:2435
**Boehm, F.,** Test of time-reversal symmetry and V-A structure of muon decay, 9:3710 (RA;US)
**Boeing, H.,** *See* Altmann, J., 9:1941
**Bogdzel', A.A.,** Use of the rise time discriminator for the improvement of the Ge(Li)-detector parameters, 9:3190 (R;SU;In Russian)
**Boghosian, B.M.,** *See* Carlson, G.A., 9:4213
**Bogoslovskaya, G.P.,** Method for calculating the temperature field in the fast reactor fuel assembly with random distribution of parameters by the Monte Carlo method, 9:2260 (R;SU;In Russian)
**Boguta, J.,** Nonlinear mean field theory for nuclear matter and surface properties, 9:3959 (J;NL)
**Bohachevsky, I.O.,** Cyclic thermal stresses in fusion reactors, 9:4221 (BA;XA)
**Bohannon, G.E.,** Extension of the soft-photon theorem for bremsstrahlung, 9:3785 (J;US)
**Bohar, L.,** *See* Szilvasi, I., 9:3368, 9:3370
**Bohmann, W.E.,** Nuclear customer services, 9:2475 (J;US)
**Bohn, R.K.,** *See* Ahl, J.L., 9:3584
**Bohn, T.S.,** *See* Deis, G.A., 9:4158
**Bol'shov, L.A.,** Evolution of spontaneous magnetic fields in an expanding laser-produced plasma, 9:4163 (R;SU;In Russian)
**Bold, F.C.,** *See* Tawil, J.J., 9:3044
**Bolikal, D.,** *See* Kim, B., 9:2995
**Bollenbacher, G.,** Economic competitiveness of fuel cell onsite integrated energy systems, 9:2590 (R;US)
**Bollini, D.,** *See* Argento, A., 9:3635
**Bolton, P.R.,** *See* Baum, G., 9:3717
**Bondarenko, G.B.,** *See* Barabash, L.S., 9:3188
**Bongartz, K.,** *See* Kovacs, W.J., 9:2244
**Bonner, B.E.,** Antinucleon-nucleon physics, 9:3659 (RA;US)
Strong interactions: few hadron systems, 9:3658 (RA;US)
Study of charmonium states, 9:3660 (RA;US)
**Bonner, B.P.,** *See* Berryman, J.G., 9:4021
**Bonner, W.F.,** *See* Knowlton, D.E., 9:2003
**Bonnevier, B.,** Equilibrium, stability and heating of plasmas in linear and toroidal Extrap pinches, 9:4132 (BA;XA)
External magnetic field configurations for EXTRAP, 9:4193 (R;SE)
**Booth, R.R.,** *See* Olden, L.R., 9:1979
**Boozer, A.H.,** *See* Reiman, A.H., 9:4200
*See* White, R.B., 9:4117
**Bor, K.,** *See* Szilvasi, I., 9:3368
**Borg, R.J.,** *See* Violet, C.E., 9:2720
**Borie, B.,** An estimate of the surface roughness effect, 9:3998 (J;DK)
**Borovsky, J.E.,** Scaling of oblique plasma double layers, 9:4092 (J;US)
*See* Tan, T.H., 9:3257
**Borowski, S.K.,** *See* Kulchar, A.G., 9:4079
**Bortignon, P.F.,** *See* Bertsch, G.F., 9:3962
**Bostick, W.D.,** Sampling and characterization of aerosols formed in the atmospheric hydrolysis of $UF_6$, 9:3279 (R;US)
**Boston, J.F.,** *See* Gallier, P.W., 9:1767
**Botts, J.L.,** *See* Walker, R.L., 9:2288
**Boucher, D.,** *See* Fliege, E., 9:3579
**Boucherle, J.X.,** *See* Burlet, P., 9:2779
**Boudrie, R.L.,** *See* Seestrom-Morris, S.J., 9:3888
*See* Ullmann, J.L., 9:3917
**Bouler, D.B. Jr.,** *See* Lewis, J.W., 9:3013
**Bourns, W.T.,** Reverse osmosis plant to process CRNL low-level radioactive liquid wastes, 9:1972 (RA;CA)
**Bowden, J.N.,** Nonstandard aging tests on coal-derived distillate fuel. Final report, July 7, 1981-July 6, 1983, 9:1766 (R;US)
**Bowen, J.L.,** Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2051 (R;US)
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2052 (R;US)
**Bowen, W.R.,** *See* Turner, A.D., 9:1945
**Bowers, M.T.,** *See* Jarrold, M.F., 9:3583
**Bowers, R.,** Collapse of iron stellar cores, 9:3493 (J;US)
**Bowman, B.M.,** *See* Miller, S.C., 9:3401
**Bowman, J.D.,** Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3914 (R;US)
*See* Sennhauser, U., 9:3881
**Bowman, J.M.,** Reduced dimensionality quantum rate constants for the $D+H_2(v = 0)$ and $D+H_2(v = 1)$ reactions on the LSTH surface, 9:2922 (J;US)
**Bowman, K.O.,** Properties of estimators for the gamma distribution, 9:4258 (J;US)
**Bowman, M.G.,** *See* Jones, W.M., 9:2115
**Bowman, M.K.,** *See* Tang, J., 9:2818
**Bowman, R.C. Jr.,** *See* Attalla, A., 9:2901
**Bowsher, C.A.,** Issues facing the future use of Alaskan NorthSlope natural gas, 9:1898 (R;US)
Legislation needed to improve administration of tax exemption provisions for electric cooperatives, 9:2533 (R;US)
**Boyarski, A.M.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
*See* Lockyer, N.S., 9:3716
**Boyd, F.C.,** Safety philosophy and licensing practice in different member states of IAEA: Canada, 9:2303 (R;DE)
**Boyd, J.T.,** *See* Dutta, S., 9:2872
**Boyd, R.D.,** *See* Linford, G.J., 9:4232
**Boyd, T.J.,** *See* McHale, E.T., 9:3115
**Boyd, W.A.,** *See* Merriman, F.C., 9:2286
**Boyer, G.D.,** Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor, 9:1989 (R;FR)
**Bozek, E.,** Projectile break-up of $^{14}N$ at 62,7 MeV, 9:3876 (R;FR)
**Bozoian, M.,** Are there bound A = 2 hyperon states, 9:3668 (RA;US)
**Bozzo, G.M.,** Underwater oil storage tank for 300 MWd, 9:1871 (BA;GB)
**Braam, J.M.,** *See* Williams, J.M., 9:2819
**Brabson, B.,** *See* Ahlen, S., 9:3720
**Bradbury, J.N.,** High-level radiation environment studies, 9:3156 (RA;US)
Radioisotope production, 9:3155 (RA;US)
**Bradley, E.B.,** *See* Arunkumar, K.A., 9:3589
**Bradshaw, J.S.,** *See* Izatt, R.M., 9:2910
**Brady, F.P.,** *See* Castaneda, C.M., 9:3894
**Brady, J.A.,** *See* Lowry, J.F., 9:1884
**Bragg, R.H.,** *See* Baker, D.F., 9:2759
**Brainard, A.,** *See* Albal, R., 9:1768
**Brainard, J.P.,** Single-ring magnetic cusp ion source, 9:3557 (J;US)
**Branam, D.A.,** *See* Bostick, W.D., 9:3279
**Brandels, L.,** Energy supplies. Proposals for research and development after 1984, 9:2578 (R;SE;In Swedish)
**Brandes, H.,** Utilization of marginal offshore gas deposits by means of mobile offshore power stations, 9:1904 (BA;GB)
**Brandt, W.,** *See* Kitagawa, Mitsuo, 9:4177
**Brannon, P.J.,** Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate, 9:2833 (R;US)
**Braswell, R.,** *See* Iwata, H., 9:2588
**Brault, D.,** Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3037 (J;US)
**Braunstein, J.,** Research opportunities in salt hydrates for thermal energy storage, 9:2521 (R;US)
**Brawer, S.,** Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2843 (J;US)
**Bray, A.R.,** *See* Balaes, A.M.E., 9:2897
**Brecher, A.,** *See* Guswa, J.H., 9:3327
**Brechignac, F.,** Growth and physiology of an industrially useful macroalga (Chondrus crispus), analyzed by continuous measurement of gas exchange, 9:3384 (R;FR;In French)
**Bregman, M.,** *See* Baker, N.J., 9:3731
**Breidenbach, M.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
*See* Lockyer, N.S., 9:3716
**Breinig, M.,** First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles, 9:3561 (J;US)
**Breit, J.D.,** Problems with the new inflationary universe, 9:3478 (J;US)
**Bremner, W.B.,** Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment, 9:2000 (R;US)
**Brenk, H.D.,** Quantifying remarks to the question of uncertainties of the 'general dose assessment

fundamentals', 9:3302 (R;DE;In German)
**Brenner, A.E.,** *See* Ankenbrandt, C., 9:3729
**Brenner, D.J.,** *See* Orrison, L.H., 9:3386
**Brenner, D.M.,** *See* Grover, J.R., 9:2992
**Breshears, W.D.,** *See* Bass, H.E., 9:2839
**Bretscher, M.M.,** Neutronic performance of a 14 MW TRIGA reactor: LEU vs HEU fuel, 9:2375 (RA;US)
**Breuer, H.,** Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon, 9:3897 (J;US)
**Brewer, P.,** *See* van Veen, N., 9:2921
**Brewer, R.L.,** Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1876 (R;US)
**Brewitz, W.,** Site evaluation for disposal facilities in salt, 9:1984 (R;DE)
**Brewster, D.R.,** *See* Keane, A.T., 9:3204
**Bridger, N.J.,** *See* Turner, A.D., 9:1945
**Brie, M.,** *See* Colin, M., 9:2280
**Briggs, A.,** *See* Molnar, S. von, 9:2799
**Briggs, R.J.,** *See* Prono, D.S., 9:3144
**Bright, R.C.,** *See* Davis, O.K., 9:3433
**Brightman, F.G.,** Split-count technique for failed fuel detection and location, 9:2246 (R;XA)
**Brisbois, L.U.,** *See* Pothier, N.E., 9:2272
**Brittain, R.D.,** Catalytic decomposition of gaseous $SO_3$, 9:2933 (J;US)
**Brizes, W.F.,** *See* Biancheria, A., 9:2297
**Broad, L.,** Remotely controlled repairs at Douglas Point NGS, 9:2271 (RA;CA)
**Brock, R.,** *See* Abolins, M., 9:3154
**Brockmann, J.E.,** *See* Tarbell, W.W., 9:2455
**Brodaczynski, G.G.,** *See* Fisher, D.R., 9:3397
**Brode, H.L.,** Analytic approximations to dynamic pressure and impulse and other fits for nuclear blasts, 9:3253 (RA;US)
Fire in targeting urban/industrial areas, 9:3249 (RA;US)
Hydrocode studies of flows generated by large area fires, 9:3234 (RA;US)
*See* Small, R.D., 9:3250
**Brodsky, S.J.,** Factorization and other novel effects in QCD, 9:3778 (R;US)
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3777 (R;US)
Quantum chromodynamics in few-nucleon systems, 9:3779 (R;US)
**Broecker, W.S.,** Climate-chemistry connection, 9:3263 (R;US)
**Broga, D.W.,** Review of three incidents involving the release of $^{125}$I from seeds interstitially implanted within the prostate gland, 9:3396 (J;GB)
**Broglia, R.A.,** *See* Bertsch, G.F., 9:3962
**Brolley, J.E.,** Edge and line enhancement by adaptive lattice filtering, 9:3226 (J;US)
**Bromberg, C.,** *See* McLaughlin, M., 9:3725
**Bromberg, L.,** *See* Cohn, D.R., 9:4207
**Bromley, D.A.,** *See* Gai, M., 9:3934
**Bronniman, C.E.,** $^{13}$C spin diffusion of adamantane, 9:2817 (J;US)
**Brooks, H.L.,** *See* Cornell, M.C., 9:2869
**Brooks, N.H.,** *See* Groebner, R.J., 9:4085
**Brower, R.C.,** Geometrical approach to moving-interface dynamics, 9:4028 (J;US)
Link fermions and dynamically correlated paths for lattice gauge theory, 9:3853 (J;NL)
**Browers, H.W. Jr.,** Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory, 9:3348 (RA;US)
Residence time, dispersal, and harvest of waterfowl using a radioactive leaching pond in southeastern Idaho, 9:3338 (RA;US)
**Brown, B.,** *See* McLaughlin, M., 9:3725
**Brown, C.E.,** CP/MAS $^{13}$C NMR spectroscopic study of chlorophyll a in the solid state, 9:3351 (R;US)
**Brown, D.R.,** *See* FitzPatrick, V.F., 9:2004
*See* Oma, K.H., 9:2002
**Brown, F.B.,** *See* Losey, D.C., 9:2373
**Brown, F.R.,** *See* Crawford, J.E., 9:2924
**Brown, G.E.,** *See* Bethe, H.A., 9:3960
*See* Mishra, V.K., 9:3607
*See* Rho, M., 9:3789
**Brown, G.L.,** Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report, 9:2176 (R;US)
**Brown, K.W.,** Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82, 9:1857 (R;US)
**Brown, P.R.,** *See* Izatt, R.M., 9:2909, 9:2910
**Brown, R.E.,** *See* Jarmie, N., 9:3146
**Brown, R.J.,** Thermal-effects study, 9:2348 (R;US)
**Bruenger, F.W.,** *See* Lloyd, R.D., 9:3404
**Brule, M.R.,** *See* Starling, K.E., 9:1790
**Brundage, W.E.,** *See* Cable, J.W., 9:2744
**Bruneau, J.L.,** Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4057 (R;FR;In French)
**Brunel, F.,** *See* Bhattacharjee, A., 9:4095
**Brunish, W.M.,** *See* Becker, S.A., 9:3458
**Buanam-Om, C.,** Raman and infrared spectroscopic studies of the structure of water ($H_2O$, HOD, $D_2O$) in stoichiometric crystalline hydrates and in electrolyte solutions, 9:3534 (R;DE)
**Bube, R.H.,** *See* Werthen, J.G., 9:2849
**Buchanan, M.V.,** Effects of hydrotreatment on the composition of mutagenic fractions of a coal-derived petroleum substitute, 9:1788 (R;US)
*See* Rubin, I.B., 9:3262
**Buchnea, A.,** A systems modeling approach to evaluating low-level waste disposal systems, 9:2014 (J;US)
**Buck, A.D.,** Studies of the constitution of fly ash using selective dissolution. Final report, 9:1796 (R;US)
**Buckley, L.P.,** Bituminization of nuclear wastes. Development, design and demonstration, 9:1973 (RA;CA)
**Budini, P.,** Spinor geometry: A genesis of extended supersymmetry, 9:4036 (R;XA)
**Budnik, V.G.,** *See* Zarubitskii, O.G., 9:2717
**Budny, R.,** Thermal consequences of plasma disruptions in TFTR and ETF, 9:4146 (BA;GB)
*See* Hwang, D., 9:4131
**Budny, R.V.,** *See* Kulsrud, R.M., 9:4134
**Budyashov, Yu.G.,** Neutron detection channel with a counter based on the SNM-14 corona counter, 9:3184 (R;SU;In Russian)
**Buecheler, E.,** *See* Jend, H.H., 9:3365
**Buechsenschuetz, R.,** Investigation of hydrogen embrittlement of steels for hydrogen flasks and pressure vessels, 9:2687 (R;XE;GE)
**Buelt, J.L.,** *See* FitzPatrick, V.F., 9:2004
*See* Oma, K.H., 9:2002
**Buerkmann, K.,** *See* Altmann, J., 9:1941
**Buescher, B.J.,** *See* Gruen, G.E., 9:2405
**Bukhvostov, A.P.,** Instanton-anti-instanton interaction in the O(3) non-linear $\sigma$ model and an exactly soluble fermion theory, 9:3745 (R;XA)
**Bullard, S.J.,** *See* Olsen, R.S., 9:3291
**Bullen, D.B.,** The effect of preinjected gas atoms on depth dependent damage in self-ion irradiated nickel, 9:2731 (J;US)
**Bunch, W.L.,** FFTF shield and gamma-ray measurements, 9:2383 (R;US)
**Bundas, D.,** Some experiments on yaw stability of wind turbines with various coning angles, 9:2187 (R;US)
**Bunker, M.E.,** Nuclei far from stability produced by high-energy protons, 9:3901 (RA;US)
**Burch, R.R.,** Coordinately unsaturated clusters. A novel catalytic reaction, 9:2988 (J;US)
**Burchat, P.,** *See* Lockyer, N.S., 9:3716
**Burden, C.J.,** Surface description of QCD with fermionic quark boundaries, 9:3843 (R;IL)
**Burenkov, A.F.,** Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3967 (R;SU;In Russian)
**Burger, G.,** *See* Swaja, R.E., 9:3980
**Burger, J.G.,** Enhanced recovery in heavy crude and bitumen deposits, 9:1848 (BA;GB)
**Burger, V.T.,** *See* Brown, C.E., 9:3351
**Burgess, D.R.,** *See* Evans, J.W., 9:2815, 9:2816
**Burie, J.,** *See* Fliege, E., 9:3579
**Burke, D.L.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
**Burke, G.J.,** Numerical electromagnetics code - method of moments. User's guide supplement for NEC-3 for modeling buried wires, 9:3107 (R;US)
**Burke, R.J.,** FMIT: an accelerator-based neutron factory for fusion materials qualification, 9:4160 (R;US)
**Burke, W.E.,** *See* Miller, D.L., 9:2129
**Burkes, J.P.,** *See* Buck, A.D., 9:1796
**Burkhard, N.R.,** Power and phase spectra for detonating cord, 9:3437 (R;US)
**Burkholder, H.C.,** Commercial waste treatment technology and programs, 9:2018 (J;US)
**Burlet, P.,** Magnetic form factor measurements in cerium hexaboride, 9:2779 (R;US)
**Burley, W.,** Test results of Thermal Ice Cap prototype and final comments. Final report, 9:2645 (R;US)
**Burnap, C.,** *See* Larsen, E.W., 9:4130
**Burnett, K.,** *See* Molander, W., 9:3544
**Burney, G.A.,** *See* Schultz, W.W., 9:2892
**Burns, B.S.,** Peak high-level waste package temperature versus annular air gap width, 9:2030 (J;US)
**Burns, M.L.,** An electron-positron jet model for the galactic center, 9:3463 (R;US)

Comparison of photon-photon and photon-magnetic field pair production rates, 9:3464 (R;US)
**Burrell, K.H.,** *See* Groebner, R.J., 9:4085
**Burrill, K.A.,** Development of a batch process for immobilizing some CRNL radioactive waste in glass, 9:1969 (RA;CA)
**Burris, N.,** *See* Janssens, J.H., 9:2134
**Bursle, A.J.,** An evaluation of current models for the propagation of stress-corrosion cracks, 9:2773 (J;US)
**Burt, S.K.,** *See* Oie, T., 9:2972
**Burtsev, V.A.,** Development and study of the first-stage amplification unit of the TIR-1M $CO_2$-laser installation, 9:4078 (R;SU;In Russian)
**Burwell, R.L. Jr.,** *See* Pielaszek, J., 9:2952
**Bush, C.E.,** *See* Kulchar, A.G., 9:4079
**Buss, R.J.,** *See* Hepburn, J.W., 9:3014
**Butler, G.W.,** *See* Bunker, M.E., 9:3901
**Butler, J.,** *See* Ankenbrandt, C., 9:3729
**Butler, J.J.,** Energetics and structures of organosulfur ions: $CH_3SSCH_3^+$, $CH_3SS^+$, $C_2H_5S^+$, and $CH_2SH^+$, 9:2987 (J;US)
**Butler, L.,** *See* Kittrell, C., 9:3580
**Butler, L.J.,** *See* Hepburn, J.W., 9:3014
**Butler, M.A.,** Chemically induced interface states in photoelectrochemical cells, 9:2131 (J;US)
**Butt, J.B.,** *See* Pielaszek, J., 9:2952
**Buvet, R.,** New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2966 (TG;US)
**Byer, R.L.,** Improved solid-state laser sources. Final technical report, 2 June 1981-1 June 1982, 9:3084 (R;US)

## C

**Cable, J.W.,** Magnetic moment distribution in Fe/sub 0.68/ $^{60}$Ni/sub 0.32/, 9:2744 (J;US)
*See* Burlet, P., 9:2779
**Cabrera, G.G.,** Use of the transfer matrix in the calculation of surface spectral densities, 9:3988 (RA;BR;In Portuguese)
**Cacuci, D.G.,** Adjoint sensitivity analysis of extremum-type responses in reactor safety, 9:2472 (J;US)
**Cadwell, J.J.,** Nuclear facility threat analysis and tactical-response procedures, 9:2473 (B;US)
**Caflisch, R.G.,** Closed-loop phase diagrams, vaporization, and multicriticality in binary liquid mixtures, 9:2859 (J;US)
**Cahalan, J.E.,** *See* Morris, E.E., 9:2491
**Cairns, E.J.,** *See* Nichols, J.T., 9:2526
**Cairns, J. Jr.,** *See* Clark, J.R., 9:3426
**Caldas, L.V.E.,** Properties of an extrapolation chamber for beta radiation dosimetry. Determination of calibration factors, 9:3178 (R;BR;In Portuguese)
**Caldwell, S.G.,** *See* Carpenter, R.W., 9:2767
**Cale, W.G.,** *See* Gardner, R.H., 9:3349
**Callegari, A.J.,** *See* Hoffert, M.I., 9:3261
**Callen, J.D.,** High-beta neoclassical current and stability experiments, 9:4133 (BA;XA)
*See* Shaing, K.C., 9:4093
**Calm, J.M.,** *See* Asbury, J.G., 9:2620
**Calnon, M.,** *See* Parker, S., 9:2090
**Camacho, A.A.,** *See* Oertel, G.K., 9:2033
**Cameron, S.,** *See* Kittrell, C., 9:3580
**Camner, P.,** Respiratory effects of air pollutants, 9:3416 (R;SE;In Swedish)
**Camp, A.L.,** *See* Behr, V.L., 9:2451
**Campbell, K.W.,** Effects of site characteristics on near-source recordings of strong ground motion, 9:3438 (R;US)
**Campbell, L.J.,** Transient behavior of rotating superfluid helium, 9:3614 (J;US)
**Campbell, M.C.,** *See* Black, J.K., 9:3168
**Canfield, D.,** *See* Frese, K.W. Jr, 9:2081
**Cano, R.,** Computation code for the energy deposition calculation of a resonant wave near the electron cyclotron frequency, 9:4055 (R;FR;In French)
**Canova, E.,** *See* Goldman, A.I., 9:2844
**Canright, G.S.,** Calorimeter for measuring ac magnetic losses in small samples, 9:3223 (J;US)
**Canter, K.F.,** Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3514 (R;US)
**Cantor, B.,** *See* Hayzelden, C., 9:2733
**Capellen, J.M.,** Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2096 (R;US)
**Capes, H.,** *See* Cano, R., 9:4055
**Caplan, M.,** *See* Dawson, J.M., 9:4139
**Caporaso, G.J.,** *See* Prono, D.S., 9:3144
**Caputo, A.J.,** *See* Stinton, D.P., 9:2045
**Carden, A.E.,** Demonstration and evaluation of plastic bag streamlining on highway trucks for drag reduction and energy savings. Final report, 9:2637 (R;US)
**Carder, B.,** Optimized rotary flux compressors for powering laser flashlamps, 9:4196 (R;US)
**Cardoso Junior, J.L.,** *See* Hussein, M.S., 9:3948
**Carithers, W.C.,** *See* Franklin, M.E.B., 9:3726
**Carius, R.,** *See* Altmann, J., 9:1941
**Carley, J.F.,** Reproducibility of chemical analyses of raw Colorado oil shales, 9:1909 (R;US)
**Carlini, R.,** Neutrino-electron elastic scattering, 9:3683 (RA;US)
*See* Rosen, S.P., 9:3680
**Carlson, B.V.,** Multiple Coulomb excitation effects in heavy ion compound and fusion cross sections, 9:3946 (R;BR)
**Carlson, C.D.,** *See* Williams, J.M., 9:2819
**Carlson, D.D.,** Organization for the performance of PRA programs, 9:2494 (BA;US)
*See* Bell, B.J., 9:2501
**Carlson, G.A.,** Designs of tandem mirror fusion reactors, 9:4213 (BA;XA)
*See* Iso, Y., 9:4205
**Carlson, J.B.,** *See* Decman, D.J., 9:3931
**Carlson, R.D.,** *See* France, D.M., 9:2216
**Carlson, T.A.,** Basic assumptions and recent developments in quantitative XPS, 9:2911 (J;GB)
**Carlsten, J.L.,** *See* Druehl, K., 9:3564
**Carman, R.L.,** *See* Rhodes, C.K., 9:4143
**Carneiro, K.,** *See* Williams, J.M., 9:2819
**Carnes, S.A.,** *See* Chester, C.V., 9:4277
**Carniglia, C.K.,** *See* Milam, D., 9:2795
*See* Rainer, F., 9:2747
**Caro, R.G.,** *See* Wang, J.C., 9:3571
**Caroumbalis, D.,** *See* Baker, N.J., 9:3731
**Carpenter, J.H.,** Study of selected off-gases produced during the immobilization of nuclear wastes in the SYNROC process. Final report for the year ended December 31, 1982, 9:2006 (R;US)
**Carpenter, R.W.,** Metal surface deformation and subsurface defect structure: a microscopy correlation study, 9:2767 (BA;US)
*See* Maziasz, P.J., 9:2769
**Carr, J.,** Search for right-handed currents in muon decay, 9:3735 (J;US)
**Carr, R.,** *See* Nesbit, W., 9:2196
**Carrick, P.G.,** $^2Pi \leftarrow X\ ^2\Sigma^+$ infrared electronic transition of $C_2H$, 9:3582 (J;US)
**Carrier, G.,** Wind-aided flame spread across strewn debris, 9:3244 (RA;US)
**Carrier, G.F.,** Criteria for onset of firestorms, 9:3236 (RA;US)
**Carroll, A.,** *See* Allinger, J., 9:3076
**Carroll, J.,** *See* Knowles, G., 9:2139
**Carroll, W.L.,** *See* Andersson, B., 9:2102
**Carruthers, P.,** Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3776 (R;US)
Correlations and fluctuations in hadronic multiplicity distributions: The meaning of KNO scaling, 9:3792 (J;NL)
Quantum collision theory with phase-space distribution functions, 9:4033 (J;US)
**Carter, T.P.,** *See* Fearey, B.L., 9:2983
**Cartwright, D.C.,** Cross sections for electron impact excitation of electronic states in $UF_6$ at incident electron energies of 10, 20, and 40 eV, 9:3549 (J;US)
**Cary, J.R.,** *See* Hanson, J.D., 9:4157
**Cashmore, A.R.,** Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3350 (R;US)
**Casini, G.,** *See* Iso, Y., 9:4205
**Casleton, K.H.,** *See* Ahl, J.L., 9:3584
**Cassagnou, Y.,** $^{20}$Ne induced peripheral reaction at 30 MeV/nucleon, 9:3875 (R;FR)
*See* Blumenfeld, Y., 9:3925
*See* Bozek, E., 9:3876
**Cassel, D.G.,** *See* Avery, P., 9:3718
**Castaneda, C.M.,** Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3894 (J;US)
**Casten, R.F.,** *See* Warner, D.D., 9:3956
**Castleman, A.W. Jr.,** *See* Kay, B.D., 9:2958
**Castoldi, C.,** *See* Ball, R.C., 9:3733
**Caton, J.E.,** *See* Tomkins, B.A., 9:2890
**Caton, R.,** *See* Welch, D.O., 9:2866
**Catto, P.J.,** *See* Tsang, K.T., 9:4113
**Causey, A.R.,** Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2278 (J;US)

**Cavanagh, R.R.,** *See* Kelley, R.D., 9:2088
**Cavin, O.B.,** *See* Koch, C.C., 9:2714
**Cederwall, R.T.,** *See* Koopman, R.P., 9:1885
*See* Ng, Y.C., 9:1827
**Ceglio, N.M.,** Imaging x-ray spectrometer for laser fusion applications, 9:4144 (J;US)
**Celata, C.M.,** Analytical approximations for the electron cyclotron absorption coefficient at the fundamental frequency in the Doppler regime, 9:4118 (J;US)
**Cence, R.J.,** *See* Taylor, G.N., 9:3732
**Cereceda, M.,** Maintenance experience in Spain, 9:2479 (J;US)
**Chaloupka, V.,** Considerations on a detector system for LAMPF II sensitive to K°/sub L/ → μe at the $10^{-12}$ level, 9:3695 (RA;US)
Searching for $K^+ \rightarrow \pi^+ \mu^+ e^-$, 9:3694 (RA;US)
**Chalupka, A.,** Progress report 1981, 9:3857 (R;AT)
Progress report 1982, 9:3858 (R;AT)
**Chambre, P.L.,** Mass transport from a waste emplaced in backfill and rock, 9:2023 (J;US)
*See* Kobayashi, R., 9:2024
*See* Pigford, T.H., 9:2025
**Champagne, A.E.,** Nucleosynthesis of $^{26}Al$ at low stellar temperatures, 9:3490 (J;US)
**Champion, R.L.,** Negative-ion detachment cross sections. Progress report, March 1, 1983-February 28, 1984, 9:3516 (R;US)
**Chan, P.K.R.,** *See* Rochelle, G.T., 9:1803
**Chan, P.S.W.,** High order method in flux mapping, 9:2267 (RA;CA)
**Chan, S.T.,** Recent results in simulating LNG vapor dispersion over variable terrain. Revision 1, 9:1886 (R;US)
**Chan, V.S.,** *See* Hsu, J.Y., 9:4088
**Chandlee, C.,** *See* McLaughlin, M., 9:3725
**Chandrasekaran, K.,** Photoreactions and photoelectrochemical effects in supported multilayer assemblies. Mechanisms of interfacial reactions involving reactive supports, metalloporphyrin surface films, and solutions, 9:3028 (J;US)
**Chandrashekar, T.K.,** ESR study of cation-crown ether induced dimerization of a water-soluble porphyrin, 9:2073 (J;US)
**Chang, B.,** Exact scattering solutions in an energy sudden (ES) representation, 9:3575 (J;US)
Validity of the energy sudden approximation, 9:3593 (J;US)
**Chang, C.H.,** *See* Zhou, B.R., 9:3791
**Chang, L.K.,** The TCLUST1 transient LMFBR intersubassembly heat transfer code, 9:2301 (J;US)
**Chang, S.G.,** *See* Oblath, S.B., 9:2965
**Chao, S.,** *See* Stalder, C.J., 9:2923
**Chapman, J.,** *See* Ahlen, S., 9:3720
**Chappell, J.R.,** Pumps-as-turbines experience profile, 9:2192 (R;US)
**Chapuran, T.,** *See* Dybdal, K., 9:3932
**Chapyak, E.J.,** Some observations on the effect of turbulence modeling in numerical simulations of multiple-burst flow fields, 9:3233 (RA;US)
**Chasanov, M.G.,** *See* Fink, J.K., 9:1931
**Chasman, R.R.,** Spherical, oblate, and prolate nuclear shapes near $^{146}Gd$, 9:3920 (J;US)
**Chatelet, J.,** *See* Clerc, M., 9:1926
**Chatillon, C.,** *See* Banon, S., 9:2798
**Chatt, A.,** *See* Desilva, K.N., 9:3181
**Chatterjee, A.K.,** *See* Gardiner, G.H., 9:2092
**Chattopadhyay, S.K.,** Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3008 (J;US)
**Chau, L.L.,** Quark mixing in weak interactions, 9:3794 (J;NL)
**Chavis, C.S.,** *See* Orzechowski, T.J., 9:3158
**Chela-Flores, J.,** Tests for complete breakdown of discrete symmetry in D neutral-anti D neutral, 9:3802 (R;XA)
**Chen, A.,** Evidence for the F meson at 1970 MeV, 9:3736 (J;US)
**Chen, C.H.T.,** Do spin and charge-exchange resonances possess a R(4)-symmetry, 9:3945 (R;BR)
**Chen, C.W.,** *See* Severin, C.S., 9:2740
**Chen, G.L.,** *See* Hedrick, C.L., 9:4141
**Chen, H.H.,** *See* Allen, R.C., 9:3684
*See* Boehm, F., 9:3710
*See* Mahler, H.J., 9:3193
*See* Wang, K.C., 9:3153
**Chen, L.D.,** *See* Baker, N.J., 9:3731
**Chen, S.Y.,** Safety analysis calculations for research and test reactors, 9:2371 (RA;US)
**Chen, Y.,** Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2792 (J;US)
*See* Summers, G.P., 9:2793
**Chen, Y.S.,** Feasibility study on feed and bleed for pressurized-water reactors, 9:2409 (R;US)
**Chen, Y.W.,** Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2087 (J;US)
**Cheng, C.P.,** *See* Schrader, G.L., 9:2951
**Cheng, E.T.,** *See* Hopkins, G.R., 9:4217
**Cheng, H.S.,** *See* Wulff, W., 9:2462
**Cherepanov, E.A.,** *See* Il'inov, A.S., 9:3937
**Cherruau, F.,** Caramel fuel in OSIRIS: the complete conversion of a high flux research to a low enriched fuel, 9:2369 (RA;US)
**Cherry, D.S.,** *See* Clark, J.R., 9:3426
**Cherry, W.B.,** *See* Orrison, L.H., 9:3386
**Chester, C.V.,** Hazard-mitigation potential of earth-sheltered residences. Final report, 1982-1983, 9:4277 (R;US)
**Chester, G.V.,** *See* Whitlock, P.A., 9:4031
**Chetyrkin, K.G.,** *See* Kataev, A.L., 9:4014, 9:4016
**Cheverton, R.D.,** Application of crack arrest theory to a thermal shock experiment, 9:2243 (BA;US)
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2404 (R;US)
**Chezick, P.,** *See* Carpenter, J.H., 9:2006
**Chi, J.W.H.,** *See* Varljen, T.C., 9:4209, 9:4220
**Chiang, S.H.,** *See* Jones, G. II, 9:3024
**Chiang, T.,** *See* France, D.M., 9:2216
*See* Kaindl, G., 9:2857
**Chien, J.C.W.,** *See* Babu, G.N., 9:3030
**Chierici, G.L.,** Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1846 (BA;GB)
**Child, H.R.,** *See* Spooner, S., 9:2776
**Childs, F.W.,** Description and operation of Haakon School geothermal-heating system, 9:2180 (R;US)
*See* Dolenc, M.R., 9:2171
**Chin, R.C.Y.,** *See* Berryman, J.G., 9:4021
**Chiogioji, M.H.,** Energy conservation policies, 9:2542 (BA;US)
**Chipman, D.M.,** Comment on ab initio calculation of spin densities in hydrocarbon radicals, 9:3577 (J;US)
Theoretical study of the properties of methyl radical, 9:3595 (J;US)
**Chiu, C.B.,** Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3740 (R;US)
**Cho, Y.,** *See* Ahlen, S., 9:3720
**Cholewa, A.F.,** Survey and assessment of the rare vascular plants of the Idaho National Engineering Laboratory, 9:3307 (RA;US)
**Chong, Y.P.,** Time-resolved beam-profile measurements on the Experimental Test Accelerator (ETA), 9:3143 (R;US)
*See* Prono, D.S., 9:3144
**Chou, Chan-Shan,** *See* Lin, Sheng-Chi, 9:2266
**Chowdhuri, P.,** Some characteristics of dielectric materials at cryogenic temperatures for HVDC systems, 9:2199 (J;US)
**Chrien, R.E.,** Experiments with Λ hypernuclei, 9:3646 (RA;US)
*See* Clark, D.D., 9:3905
**Christensen, J.J.,** *See* Izatt, R.M., 9:2909, 9:2910
**Christensen, R.N.,** *See* Burns, B.S., 9:2030
**Christos, G.A.,** Anomaly extraction from the path integral, 9:3805 (R;XA)
Note in the msub(quark) dependence of <q-barq> from chiral perturbation theory, 9:3756 (R;XA)
**Chrysochoides, N.G.,** Comparison of some measurements in the Greek Research Reactor-1 (GRR-1) with 20% and 93% enriched uranium fuel elements, 9:2380 (RA;US)
**Chu, C.K.,** High-beta tokamak plasma physics studies, 9:4138 (BA;XA)
**Chu, C.W.,** *See* Huang, S.Z., 9:2764
**Chu, J.O.,** Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr, 9:3592 (J;US)
**Chu, S.,** *See* Ho, T., 9:3551
**Chu, S.S.,** *See* Chu, T.L., 9:2871
**Chu, T.L.,** Deposition and properties of zinc phosphide films, 9:2871 (J;US)
**Chu, W.K.,** *See* Picraux, S.T., 9:2836, 9:2842
**Chu, Y.Y.,** Identification of $^{233}Ac$, 9:3941 (J;US)
**Chung, C.,** *See* Schmid, M., 9:3161
**Chung, M.K.,** Survey of fusion reactor technology. Development of design technology for the magnet system of Tokamak fusion reactor, 9:4182 (R;KR;In Korean)
**Chung, T.H.,** *See* Lee, L.L., 9:2950
*See* Starling, K.E., 9:1790
**Chutjian, A.,** *See* Cartwright, D.C., 9:3549
**Chvartatskij, R.V.,** *See* Gusev, S.V., 9:4188

*See* Zhilin, P.A., 9:4189
**Clynoweth, D.P.,** *See* Biljetina, R., 9:2080
*See* Fannin, K.F., 9:2085
**Clhangir, S.,** *See* McLaughlin, M., 9:3725
**Claes, J.,** *See* Voorde, N. van de, 9:1955
**Claeys, W.,** *See* Mitchell, J.B.A., 9:3565
**Clamens, H.,** *See* Depois, J., 9:2517
**Clark, B.C.,** Energy dependence of the relativistic impulse approximation for proton-nucleus elastic scattering, 9:3895 (J;US)
**Clark, D.D.,** Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3905 (R;US)
**Clark, G.W.,** *See* Holder, J.D., 9:2811
**Clark, J.C.,** *See* Chong, Y.P., 9:3143
*See* Prono, D.S., 9:3144
**Clark, J.R.,** Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3426 (J;US)
**Clark, N.,** *See* Moncada, G., 9:2699
**Clark, N.A.,** *See* Hanley, H.J.M., 9:3605
**Clark, R.D.,** Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982, 9:1797 (R;US)
**Clark, S.K.,** *See* Tabaddor, F., 9:2807, 9:2808
**Clausing, R.E.,** *See* Jackson, G.L., 9:4202
**Cleary, M.P.,** Design of hydraulic fracturing treatments, 9:1893 (RA;US)
**Cleland, W.E.,** *See* Antonio, M.R., 9:2942
**Clem, J.R.,** *See* Eichele, R., 9:3074
**Clement, J.D.,** *See* Wan, P.T., 9:2032
**Clements, T.L.,** *See* Mayberry, J.L., 9:2038
**Clemmer, R.,** *See* Baker, C., 9:4219
**Clendenin, J.E.,** *See* Baum, G., 9:3717
**Clerc, M.,** Process for separation of isotopes from a gaseous mixture, 9:1926 (TG;US)
**Cleveland, C.L.,** *See* Barnett, R.N., 9:2718
**Clinch, J.M.,** *See* Abelson, H.F., 9:2619
**Cline, C.F.,** *See* Holt, J.B., 9:2766, 9:2771
**Cline, T.L.,** *See* Gehrels, N., 9:3467
**Clisset, H.,** *See* Zakkay, V., 9:2626
**Clothiaux, E.J.,** *See* Beiersdorfer, P., 9:3216
**Cloutman, L.D.,** Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine, 9:3123 (R;US)
**Coady, J.,** Preparing to license deep disposal facilities. The international scene, 9:1981 (RA;CA)
**Coates, R.,** Air monitoring requirements and alarm response procedures in reprocessing plants, 9:1968 (RA;CA)
**Coceva, C.,** Calculation of the ORELA neutron moderator spectrum and resolution function, 9:3162 (J;NL)
**Coey, J.M.D.,** *See* Pan, H.K., 9:2979
**Coffin, C.T.,** *See* Ball, R.C., 9:3733
**Coffman, F.E.,** The U.S. DOE commercial waste disposal programs, 9:2043 (J;US)
**Cohan, N.V.,** Physical adsorption and molecular dynamics, 9:2823 (RA;BR;In Spanish)
**Cohen, B.I.,** Computations in plasma physics, 9:4129 (J;US)
*See* Langdon, A.B., 9:4127
**Cohen, E.G.D.,** *See* Kincaid, J.M., 9:3604
**Cohen, J.B.,** *See* Pielaszek, J., 9:2952
**Cohen, M.L.,** *See* Froyen, S., 9:2854
**Cohen, R.H.,** Potentials in thermal barriers with strong electron-cyclotron heating, 9:4099 (J;US)
**Cohn, D.R.,** Near-term tokamak reactor designs with high performance resistive magnets, 9:4207 (BA;XA)
**Coit, R.,** *See* McKee, C., 9:2195
**Coker, W.R.,** *See* Hoffmann, G.W., 9:3892
**Colaizzi, G.J.,** *See* Schmid, J.P., 9:1799
**Colbert, J.,** Evolution of a metal: A photoemission study of the growth of Pd clusters, 9:2739 (J;US)
**Colchin, R.J.,** *See* Hiroe, S., 9:4082
**Cole, A.G.,** *See* Prono, D.S., 9:3144
**Cole, N.,** Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3317 (RA;US)
**Cole, P.W.,** *See* Deupree, R.G., 9:3489
**Colgate, S.A.,** Gamma-burst emission from neutron-star accretion, 9:3452 (R;US)
**Colin, M.,** Survey of C.E.A. absorber materials development program, 9:2280 (R;FR)
*See* Kryger, B., 9:2778
**Collin, W.,** Report of consultants to the IAEA on requirements for the safe transport of low hazard radioactive materials, 9:1929 (R;DE)
**Collins, W.M.,** PRESCON-2 simulation of the OECD/CSNI containment analysis standard problem no. 2, 9:2427 (RA;CA)
**Colmenares, C.A.,** *See* McLean, W., 9:2790
**Colombant, D.G.,** Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid, 9:4115 (J;US)
Stimulated Brillouin backscattering in long-scale-length plasmas, 9:4123 (J;US)
*See* Cooperstein, G., 9:4228
**Colombo, A.G.,** BAESNUM, a conversational computer program for the Bayesian estimation of a parameter by a numerical method, 9:4246 (R;XE)
Characterization of the Dirichlet distribution as prior, 9:4247 (R;XE)
**Colonna, S.,** Castoro Sei introduces new standards of reliability and efficiency in pipelaying, 9:1901 (BA;GB)
**Coltrin, M.E.,** *See* Schwenke, D.W., 9:3594
**Comar, D.,** *See* Berget, G., 9:3356
**Combs, S.K.,** *See* Milora, S.L., 9:4230
*See* Schuresko, D.D., 9:4152
**Compton, R.N.,** *See* Alton, G.D., 9:3568
**Conforto, G.,** *See* Ball, R.C., 9:3733
**Conjeaud, M.,** *See* Blumenfeld, Y., 9:3925
*See* Cassagnou, Y., 9:3875
**Conn, R.W.,** Alternate fusion-fuel-cycle plasma physics and reaction kinetics. Final report, 9:4154 (R;US)
Fusion reactors: physics and technology. Annual progress report, 9:4153 (R;US)
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4050 (R;US)
*See* Kantrowitz, F., 9:4046
**Connell, J.D.,** *See* Newman, L.W., 9:2223
**Connelly, J.W.,** Sage grouse census methods and populations in southeastern Idaho, 9:3347 (RA;US)
Sage grouse on the Idaho National Environmental Research Park, 9:3325 (RA;US)
**Connolly, J.F.,** *See* Bateman, J.E., 9:3197, 9:3383
**Connolly, P.L.,** *See* Baker, N.J., 9:3731
**Contar, J.M.R.,** Multiwire proportional chamber for Moessbauer studies of surfaces, 9:3177 (RA;BR;In Portuguese)
**Conti, M.,** *See* Pizzini, S., 9:2137
**Cooke, D.W.,** *See* MacLaughlin, D.E., 9:2726
**Cooke, R.H.,** Some specialized radiological safety considerations at Argonne National Laboratory's heavy ion research facility, 9:3163 (J;US)
**Cool, D.A.,** Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3400 (J;GB)
**Cooper, J.H.,** *See* Walker, R.L., 9:2288
**Cooper, M.,** Rare muon decay, 9:3707 (RA;US)
**Cooper, M.D.,** *See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Cooper, R.,** A pulse radiolysis study of the excitation of nitrogen and aromatic hydrocarbons in rare gas-additive mixtures: Evidence for subexcitation electron interactions, 9:3038 (J;US)
**Cooper, S.L.,** *See* Pan, H.K., 9:2979
**Cooper, S.R.W.,** *See* McLaughlin, M., 9:3725
**Cooper, W.,** Fermilab tevatron quadrupoles, 9:3129 (J;US)
**Cooperstein, G.,** Light-ion inertial confinement fusion research at Naval Research Laboratory, 9:4228 (BA;XA)
**Cooperstein, J.,** *See* Bethe, H.A., 9:3960
**Coppi, B.,** Instability of fusing plasmas and spin-depolarization processes, 9:4125 (J;US)
**Corbella, O.D.,** *See* Krenzinger, A., 9:2781
**Corbett, J.D.,** Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2935 (J;US)
*See* Ford, J.E., 9:2927
**Cordova, F.A.,** *See* Jensen, K.A., 9:3487
**Cordts, R.E.,** Antiemetic studies both pre and post exposure: preliminary findings. Preliminary report Jan-Oct 82, 9:3391 (R;US)
**Corman, J.C.,** Experimental simulation and advanced control aspects of the IGCC concept. Part I. Simulation results, 9:1757 (R;US)
**Cornell, M.C.,** Electron drift velocities in gas mixtures of He, $N_2$, and $CO_2$, 9:2869 (J;US)
**Cornella, R.J.,** *See* Bretscher, M.M., 9:2375
**Cornuel, P.,** Permanently located offshore structures the development of steel offshore jackets, 9:1838 (BA;GB)
**Corradini, M.L.,** *See* Berman, M., 9:2453
**Cort, G.,** *See* Taylor, R.D., 9:2745
**Corteville, J.,** *See* Grouvel, J.M., 9:1862
**Cossairt, J.D.,** Recent muon fluence measurements at Fermilab, 9:3972 (J;GB)
**Costa, M.E.V.,** Quantization of gauge invariant theories through the Dirac bracket formalism, 9:4012 (R;BR)
**Costa, R.B. da,** *See* Majlis, N., 9:3984
**Costantini, D.,** *See* Colombo, A.G., 9:4247
**Coste, A.,** *See* Clerc, M., 9:1926
**Costello, C.E.,** *See* Abrams, M.J., 9:3045
**Cota, L.,** *See* Oliver, A., 9:3095
**Cottam, M.G.,** *See* Sarmento, E.F., 9:3522, 9:3526

**Coulter, G.A.,** Blast loading of closures for use on shelters, 9:3061 (RA;US)
**Courville, G.A.,** Professionalism in commercial infrared sensing: an update, 9:2665 (R;US)
**Cowley, J.M.,** Applications of microdiffraction with a STEM instrument, 9:3224 (J;US)
*See* Turner, P.S., 9:2804
**Cowley, R.A.,** *See* Hagen, M., 9:2860
**Cox, D.E.,** *See* Bennett, J.M., 9:2934
*See* Moodenbaugh, A.R., 9:2931
**Craig, E.H.,** *See* Arthur, W.J., 9:3288
*See* Craig, T.H., 9:3324
**Craig, T.H.,** Raptor studies on the Idaho National Engineering Laboratory, 9:3324 (RA;US)
*See* Arthur, W.J., 9:3288
**Craigie, N.S.,** Critical analysis of the electromagnetic mass shift problem in QCD, 9:3747 (R;XA)
**Cramer, J.G.,** Arrow of electromagnetic time and the generalized absorber theory, 9:3482 (J;US)
**Crandall, J.,** High-level waste description, inventory and hazard, 9:1948 (R;US)
**Crane, D.W.,** *See* Becker, C.D., 9:3424
**Crawford, H.J.,** *See* Olson, D.L., 9:3883
**Crawford, J.E.,** Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls, 9:2924 (J;US)
**Crawford, O.H.,** Position-dependent stopping power for channeled ions, 9:3973 (J;US)
**Crawford, T.V.,** Technical bases for offsite emergency planning at SRP, 9:2407 (R;US)
**Craxton, R.S.,** Interpretation of Livermore third-harmonic-generation experiments, 9:3085 (J;US)
**Creedon, J.M.,** *See* Bailey, V.L., 9:4204
**Creutz, M.,** High-energy physics, 9:3615 (J;US)
Monte Carlo computations in lattice gauge theories, 9:3855 (J;NL)
*See* Barkai, D., 9:3850
**Crichlow, H.B.,** *See* Nguyen, H., 9:1825
**Cristol, S.J.,** Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system, 9:3023 (J;US)
**Cristy, G.A.,** *See* Chester, C.V., 9:4277
**Crocker, J.G.,** Safety considerations in fusion reactor design, 9:4224 (BA;XA)
**Crocker, T.,** *See* Siegel, S.M., 9:3423
**Croff, A.G.,** Transuranic waste management: technology status and needs, 9:2037 (J;US)
**Cronin, J.W.,** Consideration of a measurement of (eta$_{00}$)$^2$/(eta/sub +-/)$^2$, 9:3687 (RA;US)
**Crostack, H.A.,** Investigations of the mechanical behavior of spot welded joints by means of acoustic emission analysis, 9:3103 (TG;US)
**Crosthwaite, J.L.,** Design of containment for the long-term isolation of irradiated fuel during underground disposal, 9:1976 (RA;CA)
**Crumpton, W.G.,** Effects of differential growth and mortality in the seasonal succession of phytoplankton populations in Lawrence Lake, Michigan, 9:3329 (J;US)
**Csakany, G.,** *See* Szilvasi, I., 9:3368, 9:3370
**Csanady, G.T.,** *See* Ping-Tung Shaw, 9:3445
**Cser, I.,** *See* Meszaros, T., 9:3363
**Csobaly, S.,** *See* Meszaros, T., 9:3363
*See* Szilvasi, I., 9:3370
**Csorna, S.E.,** *See* Alam, M.S., 9:3719
*See* Chen, A., 9:3736
**Cuderman, J.F.,** High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1897 (R;US)
**Cumming, J.B.,** *See* Kowalski, L., 9:3903
**Cunliffe, A.R.,** *See* Rayment, R., 9:2616
**Cunningham, D.R.,** *See* Teagan, W.P., 9:2671
**Curado, E.M.F.,** Surface tension calculation of the Ising model in square lattice using the renormalization group, 9:3525 (RA;BR;In Portuguese)
**Curl, R.F. Jr.,** *See* Carrick, P.G., 9:3582
**Curro, J.G.,** *See* Mark, J.E., 9:2814
**Curtis, C.W.,** Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1769 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1770 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1771 (R;US)
*See* Williams, D.C., 9:1762
**Curtiss, L.A.,** *See* Papatheodorou, G.N., 9:3596
**Cutkosky, R.E.,** Baryon spectroscopy, 9:3673 (RA;US)

## D

**D'Agostini, G.,** Inclusive production of electrons and muons in multihadronic events at PETRA, 9:3625 (R;DE)
**Dabbs, J.W.T.,** Measurement of the /SUP 242m/ Am neutron fission cross section, 9:3942 (J;US)
**Dahlgren, T.,** Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2663 (R;SE;In Swedish)
**Dahlin, E.,** *See* Saheb, E., 9:2270
**Dahn, E.,** *See* Augustson, R.H., 9:2061
**Dalgarno, A.,** Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3515 (R;US)
**Dalhed, H.E.,** *See* Bonnevier, B., 9:4132
**Dall'aglio, D.,** *See* Colonna, S., 9:1901
**Dalla Casa, G.,** *See* Chierici, G.L., 9:1846
**Dallas, M.,** *See* Cornuel, P., 9:1838
**Dalluege, K.H.,** *See* Huettner, J., 9:3377
**Dam, A.S.,** Survey of power plant LLW volume reduction and storage actions/plans, 9:2010 (J;US)
**Dame, R.E.,** Line-focusing adjustable parabolic solar-concentrating collector. Final report, 9:2148 (R;US)
**Damien, D.,** *See* Otter, C., 9:2471
**Danby, G.,** *See* Allinger, J., 9:3076
**Danese, L.,** *See* Smoot, G.F., 9:3477
**Daniel, H.,** Surface studies with muons, 9:2896 (RA;US)
**Daniel, J.A.,** Identification of fuel debris in TMI-2 systems by gamma-ray spectroscopy, 9:2464 (J;US)
**Danielwicz, E.J.,** FIR laser-development program. Final report, 9:4047 (R;US)
**Danti, K.,** Geothermal potential of Marine Corps Mountain Warfare Training Center at Pickel Meadow, California. Technical memo, 9:2155 (R;US)
**Darbaidze, Ya.Z.,** *See* Garsevanishvili, V.R., 9:3949
**Das, P.,** *See* van Veen, N., 9:2921
**Das, P.K.,** *See* Chattopadhyay, S.K., 9:3008
**Das, T.P.,** *See* Beri, A.C., 9:2788
**Dastur, A.R.,** Dynamic flux synthesis with discontinuous trial functions, 9:2263 (RA;CA)
**Datta, R.,** Methanol bioconversion by Butyribacterium methylotrophicum--batch fermentation yield and kinetics, 9:2133 (J;US)
**Daugherty, J.K.,** Pair production and annihilation in strong magnetic fields, 9:3465 (R;US)
*See* Harding, A.K., 9:3468
**Davenport, F.F.,** *See* Watson, A.E., 9:2899
**Davidovits, P.,** Chemiluminescence and laser induced fluorescence of boron atom reactions. Final progress report, 9:2912 (R;US)
**Davids, C.N.,** *See* Murphy, M.J., 9:3896
**Davidson, A.,** Complex Rishon-type unification, 9:3841 (R;IL)
Do 't Hooft anomaly equations know about Georgi-Glashow grand unification, 9:3840 (R;IL)
**Davidson, H.L.,** Approach to real-time holography, 9:4252 (R;US)
Some predictions on the performance of future supercomputers for simulation and control, 9:4254 (R;US)
**Davies, K.T.R.,** Effect of dissipation on the eigensolutions near the fission saddle point, 9:3957 (J;US)
**Davies, R.G.,** You have no right to make me think about this--the de-legitimation of current nuclear policies among key American elites, 9:2550 (R;US)
**Davis, A.,** *See* Kuehn, D.W., 9:1789
**Davis, H.A.,** Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures, 9:3220 (J;US)
**Davis, J.I.,** Status and prospects for lasers in isotope separation, 9:2070 (J;GB)
**Davis, M.,** *See* Frenk, C.S., 9:3484
**Davis, O.K.,** Late-Pleistocene vegetation history of the Idaho National Engineering Laboratory, 9:3433 (RA;US)
**Davis, R.J.,** *See* Goldman, M.I., 9:2463
**Davis, S.L.,** Utility considerations in emotional stability monitoring for nuclear plant personnel, 9:2200 (R;US)

**Davis, W.A.,** *See* Hiroe, S., 9:4082
**Davison, A.,** *See* Abrams, M.J., 9:3045
**Davison, J.E.,** *See* Salyer, I.O., 9:3036
**Davison, P.,** Treatment fluids to improve sea water injection, 9:1847 (BA;GB)
**Daw, H.T.,** International regulations for radiation protection, 9:1964 (R;DE)
**Dawson, J.M.,** Theory and simulation of RF heating and current drive, 9:4139 (BA;XA)
**Dawson, L.R.,** *See* Fritz, I.J., 9:2845
*See* Picraux, S.T., 9:2836, 9:2842
*See* Zipperian, T.E., 9:3110
**Dawson, S.,** Do light colored scalars exist?, 9:3854 (J;US)
**Dayan, J.,** *See* Yavuzkurt, S., 9:1910
**Dayras, R.,** *See* Bozek, E., 9:3876
*See* Cassagnou, Y., 9:3875
**Dayras, R.A.,** *See* Shapira, D., 9:3887
**De Amici, G.,** *See* Smoot, G.F., 9:3477
**De Jonghe, L.C.,** Impurities and solid electrolyte failure, 9:2532 (J;NL)
*See* Allender, J.S., 9:2975
**De Leon, N.,** Semiclassical quantization and extraction of eigenfunctions using arbitrary trajectories, 9:4032 (J;US)
**de Ris, J.,** Flammability testing state-of-the-art, 9:3093 (RA;US)
**De Sangro, R.,** *See* Fernandez, E., 9:3723
**de Sivry, B.,** *See* Fournie, R., 9:1865
**De Zotti, G.,** *See* Smoot, G.F., 9:3477
**Dearden, D.V.,** *See* Izatt, R.M., 9:2910
**DeBotton, N.R.,** *See* Baum, G., 9:3717
**Decher, U.,** *See* Matzie, R.A., 9:2235
**Decker, R.W.,** Evaluation of novel coal cutting concepts for reduced dust generation. Open file report 28 Sep 79-7 Jan 81, 9:1810 (R;US)
**Decman, D.J.,** Electromagnetic properties of isomers in $^{210}$Pb, 9:3931 (J;US)
**Decourciere, P.,** *See* Madoz, J.P., 9:2209
**Decyk, V.K.,** *See* Dawson, J.M., 9:4139
**Degen, G.,** Fast breeder reactor at Kalkar. Pt. 2. Uncalculable risk - intolerable risk. Law suit going on, 9:2513 (B;DE;In German)
**DeHart, R.M.,** High altitude radiation exposure in the SR-71: a preliminary report. Professional study, 9:3390 (R;US)
**Dehmer, J.L.,** *See* Pratt, S.T., 9:3573
**Dehmer, P.M.,** *See* Pratt, S.T., 9:3573
**Dehnhard, D.,** *See* Seestrom-Morris, S.J., 9:3888
**Dehnhard, D.K.,** *See* Bhatia, T.S., 9:3152
**Deis, G.A.,** Final report on PE-II activities from August 1981-September 1983, 9:4158 (R;US)
**Dejbakhsh, H.,** *See* Wohn, F.K., 9:3918
**Deju, R.A.,** Summary of the Basalt Waste Isolation Project, 9:2022 (J;US)
**del Campo, J.G.,** *See* Shapira, D., 9:3887
**Delaporte, P.,** *See* Cornuel, P., 9:1838
**Delaunay, M.,** Production of negative $D^-$ ions by double charge exchange using cesium, 9:4231 (TG;US)
**Delimarskii, Yu.K.,** *See* Roms, Yu.G., 9:2774
**Delos, J.B.,** *See* Wang, T.S., 9:3555
**DeLuca, R.A.,** *See* Miller, R.L., 9:4184
**DeLucia, J.,** *See* Izzo, R., 9:4120
**Demaison, J.,** *See* Fliege, E., 9:3579
**Demenkov, V.G.,** *See* Romanov, V.M., 9:3966
**Dement'ev, V.A.,** Dynamics of radiation-induced point defects in metals, 9:2692 (R;SU;In Russian)
**Denison, L.,** *See* Cooper, R., 9:3038
**Deniz, A.V.,** *See* Chu, C.K., 9:4138
**Denney, Dorset, E.J.,** Improvements to gas detection systems, 9:1844 (BA;GB)
**Denning, D.,** Research topics in statistical database management, 9:4263 (R;US)
**Denning, R.S.,** Fission product behavior and containment response models for use in PRA studies, 9:2496 (BA;US)
**Deo, B.B.,** Generation of baryon excess in SU/sub L/$_2$ x SU/sub R/$_2$ x SU/sub c/$_4$, 9:3801 (R;XA)
**Depois, J.,** Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2517 (R;XE;FR)
**Deppert, W.,** Role of interaction in neutrino statistics. In memory of Bronislaw Kuchowicz, 9:3749 (R;XA)
**Depraz, J.,** *See* Bremner, W.B., 9:2000
**Dermendjiev, E.,** *See* Augustson, R.H., 9:2061
**Desilva, K.N.,** Development of a method to correct for coincidence losses in high count rate gamma-ray spectrometry, 9:3181 (RA;CA)
**Dessagne, P.,** *See* Bernas, M., 9:3899
**Deuber, H.,** Aspects of retention of airborne $^{131}$I in light water reactors during normal operation, 9:2207 (RA;XA)
**Deuel, L.E. Jr.,** *See* Brown, K.W., 9:1857
**Deupree, R.G.,** Survey of the core helium flash with dynamic convection, 9:3489 (J;US)
**Deutsch, J.,** Muon capture, 9:3706 (RA;US)
**DeVan, J.H.,** *See* Griess, J.C., 9:2749
**Devito, B.,** *See* Allinger, J., 9:3076
**DeVries, L.,** *See* Smith, P.H., 9:2523
**Dew-Hughes, D.,** *See* Bilello, J.C., 9:2729
**Dewandre, T.,** *See* Simon, A., 9:4122
**Dewar, R.L.,** Ballooning mode spectrum in general toroidal systems, 9:4119 (J;US)
**Dewez, P.,** *See* Fanjas, Y., 9:2362
**DeWire, J.W.,** *See* Avery, P., 9:3718
**Deworm, J.P.,** Experience with a standardized method and application of the recent trends for in-situ testing of HEPA-filtration systems, 9:3122 (RA;XA)
**Dexter, R.N.,** *See* Callen, J.D., 9:4133
**Dhawan, S.,** *See* Howell, R.H., 9:3132
**Dhawan, S.K.,** *See* Baum, G., 9:3717
**Dhere, N.G.,** Characterization of the substrate surface, nucleation and initial growth in the thin film formation, 9:3518 (RA;BR;In Portuguese)
**Diamond, R.N.,** *See* Jenkins, C.M., 9:3727
**Dias, H.,** *See* Soares, J.C., 9:3926
**Diaz, N.J.,** Transfer of educational programs to the nuclear utility industry, 9:2485 (J;US)
**Dickens, J.K.,** Comment on "Determination of gamma-ray energies and abundances of $^{229}$Th", 9:3940 (J;US)
*See* Bell, Z.W., 9:3898
**Dickenson, W.A.,** *See* Cristol, S.J., 9:3023
**Dickson, J.C.,** Impacts of alcohol fuels on the US refining industry, 9:2647 (R;US)
**Dicus, D.A.,** Electron-positron annihilation cross section in SU(2)/sub L/xU(1) supergravity, 9:3722 (J;US)
**Diegert, K.V.,** *See* Strip, D., 9:2492
**Dienes, G.J.,** *See* Paskin, A., 9:3997
**Dieser, K.,** *See* Buechsenschuetz, R., 9:2687
**Dieterle, B.,** Tagged antineutron experiments, 9:3661 (RA;US)
**Dietrich, G.,** Uranium and thorium reserves of the world. Prospecting, mining, and costs, 9:1913 (B;DE;In German)
**Dietz, C.F.,** Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82, 9:1896 (R;US)
**Digges, T.G., Jr.,** *See* Schmid, F., 9:2121
**DiGregorio, D.,** *See* Shapira, D., 9:3887
**DiMelfi, R.J.,** *See* Kramer, J.M., 9:2296
**Dine, M.,** *See* Affleck, I., 9:3821
**Dinejkhan, M.,** Constant of the baryon-meson strong interaction, 9:3770 (R;SU;In Russian)
**Dionisio, G.,** *See* Pizzini, S., 9:2137
**Dippel, T.,** *See* Kartes, H., 9:1954
**Dirninger, G.,** *See* Chalupka, A., 9:3857, 9:3858
**Ditrikh, Yu.,** Comparison of the ionooptical parameters of one- and two-stage accelerator systems, 9:3150 (R;SU;In Russian)
**Dixit, S.N.,** *See* Mazumdar, S., 9:3541
**Dixon, D.F.,** Management of radwaste at Chalk River, Canada: storage and disposal, 9:2011 (J;US)
Strategy for the disposal of low- and intermediate-level radwastes in Canada, 9:1978 (RA;CA)
**Dixon, G.J.,** *See* Breinig, M., 9:3561
**Dobbs, J.N.,** Low-temperature dielectric constant of near-stoichiometric Na $\beta$-alumina, 9:2809 (J;US)
**Dodd, C.V.,** *See* Hobson, D.O., 9:2751
**Dodds, S.A.,** Studies of magnetic phase transitions with muons, 9:2710 (RA;US)
**Dodson, G.W.,** *See* Hertzog, D.W., 9:3721
**Doe, P.J.,** *See* Allen, R.C., 9:3684
*See* Mahler, H.J., 9:3193
**Doeldissen, W.,** Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3031 (R;DE;In German)
**Doerner, R.C.,** *See* Meek, C.C., 9:2406
**Doherty, M.G.,** Field and laboratory support for the coproduction of gas and water program. Annual report 1 Apr 82-31 Mar 83, 9:1879 (R;US)
**Dolbilov, G.V.,** *See* Aleksandrov, V.S., 9:3138
**Dolenc, M.R.,** Evaluation of direct-use-project drilling costs, 9:2171 (R;US)
**Dolgov, A.D.,** Possible mechanism of cosmological term cancellation, 9:3450 (R;SU)
**Doll, J.D.,** *See* McDowell, H.K., 9:2732
**Domagala, R.F.,** Status of uranium-silicon alloy fuel development for the RERTR program, 9:2357 (RA;US)
**Dominguez, B.,** *See* Kruse, L.W., 9:2063
**Dominguez, R.R.,** *See* Waltz, R.E., 9:4096
**Donich, T.R.,** Preliminary nuclear terrorist effects study, 9:3256 (RA;US)
**Doran, T.C.,** *See* Rosehart, R.G., 9:2262
**Dorel, M.,** Remote-control of a blowout preventer and instrumented pup-joint of a riser, 9:1832 (BA;GB)
*See* Vandoorne, B., 9:1831

**Dorfan, J.M.,** *See* Jaros, J.A., 9:3724
**Dorman, R.G.,** Trends and developments for in-situ testing of HEPA filters, 9:3118 (RA;XA)
**Dormuth, K.W.,** Use of the SYVAC computer code in assessing a nuclear fuel waste disposal concept, 9:1977 (RA;CA)
**Dorn, D.W.,** Issues in radioactivity for fusion energy: remote maintenance rating, 9:4197 (R;US)
**Doroba, K.,** *See* Ankenbrandt, C., 9:3729
**Douglas, J.,** Roadmap for complex decisions, 9:4244 (J;US)
**Doutriaux, D.,** *See* Roshd, M., 9:2239
**Dover, C.B.,** *See* Auerbach, E.H., 9:3793
*See* Gibson, B.F., 9:3642
**Doverspike, L.D.,** *See* Champion, R.L., 9:3516
**Dowdy, E.J.,** *See* Taylor, G.W., 9:2259
**Downey, S.W.,** *See* Nogar, N.S., 9:3194
**Downum, W.B.,** Oak Ridge National Laboratory ELMO Bumpy Torus radially resolved, time-dependent, one-dimensional transport code - user's guide, 9:4081 (R;US)
**Doyle, J.C.,** *See* Harvey, C.A., 9:2568
**Drachman, R.J.,** Low-temperature positron annihilation, 9:3466 (R;US)
**Drake, D.M.,** *See* Peng, J.C., 9:3909
*See* Tinsley, J.R., 9:3933
**Drake, J.R.,** *See* Bonnevier, B., 9:4132
**Dreibelbis, W.G.,** *See* Schuresko, D.D., 9:3269
**Dreizler, H.,** *See* Fliege, E., 9:3579
**Drew, L.J.,** Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1819 (R;US)
**Drexler, G.,** *See* Kramer, R., 9:3979
**Droemer, D.W.,** *See* McLean, E.A., 9:4190
**Dropesky, B.J.,** Activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei, 9:3880 (RA;US)
Nuclear chemistry, 9:3911 (RA;US)
*See* Bunker, M.E., 9:3901
**Druehl, K.,** Observation of solitons in stimulated Raman scattering, 9:3564 (J;US)
**Dubasov, V.G.,** Normal phase detection in the "Tokamak-15" toroidal coil, 9:4185 (R;SU;In Russian)
**Dubinin, M.N.,** Hadronic heavy flavour production from the 2 → 3 QCD subprocess, 9:3760 (R;SU)
**DuBois, M.R.,** Homogeneous hydrogenolysis of carbon disulfide catalyzed by a molybdenum dimer with sulfido ligands, 9:2943 (J;US)
**Dubrulle, A.,** *See* Fliege, E., 9:3579
**Duckhorn, S.L.,** *See* Richards, L.W., 9:3272
**Duff, R.E.,** *See* Barthel, J.R., 9:3512
**Dugan, E.T.,** *See* Diaz, N.J., 9:2485
**Dugundji, J.,** *See* Bundas, D., 9:2187
**Duka-Zojomi, A.,** *See* Bogdzel', A.A., 9:3190
**Duncan, C.S.,** Apparatus for growing a dendritic web, 9:2867 (P;US)
**Duncan, D.R.,** *See* Bard, F.E., 9:2289
**Dunn, R.D.,** Fundamental investigations of underground coal gasification. Annual report Mar 82-Mar 83, 9:1777 (R;US)
**Dunning, F.B.,** *See* McConnell, R.P., 9:2719
**Dunning, T.H. Jr.,** *See* Garrett, B.C., 9:2949
**Dupoux, J.,** Analysis of the five years in-situ control of the cleaning filters used in the nuclear installations in France, 9:2350 (RA;XA;In French)
**Dupre, Corinne,** Application of the Monte Carlo method to the study of the response of an organic liquid scintillator irradiated by photons, 9:3174 (R;FR;In French)
**Dupuis, M.,** *See* Takada, T., 9:2990
**Durgut, M.,** SU(N)-$QCD_2$ meson equation in next-to-leading order, 9:3806 (R;XA)
**Dusek, J.T.,** Porous electrolyte retainer for molten carbonate fuel cell, 9:2592 (P;US)
**Dutta, S.,** Rutherford backscattering evidence for solid phase laser annealing of Corning 7059 glass and ZnO thin films, 9:2872 (J;US)
**Duval, J.,** Undersea excavation test for the protection of submerged equipment in the arctic seas, 9:1843 (BA;GB)
**Duvet, C.,** North-East Grondin experimental station, 9:1842 (BA;GB)
**Dwyer, J.R.,** *See* Merriman, F.C., 9:2286
**Dybdal, K.,** High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3932 (J;US)
**Dykhne, A.M.,** *See* Bol'shov, L.A., 9:4163
**Dzubay, T.G.,** *See* Stevens, R.K., 9:3271

## E

**Eatherly, W.P.,** Recent developments in graphite for HTGR applications, 9:2254 (J;US)
**Ebbesen, T.W.,** Photochemistry of methyl viologen in aqueous and methanolic solutions, 9:3015 (J;US)
**Eberhard, W.L.,** Eye-safe tracking of oil fog plumes by UV lidar, 9:3277 (J;US)
**Ebnesajjad, S.,** Dissolution of coal in solvents, 9:1783 (D;US)
**Eby, R.E.,** *See* Narayan, J., 9:2840, 9:2878
**Ecker, B.M.,** *See* Bailey, V.L., 9:4204
**Eckert, J.,** *See* Howard, J., 9:3975
**Eckhause, M.,** *See* Hertzog, D.W., 9:3721
**Eckstein, Y.,** *See* Roach, P.R., 9:3608
**Edmonds, P.H.,** *See* Kulchar, A.G., 9:4079
**Edwards, C.,** Study of the decay J/psi→γeta$\pi\pi$, 9:3728 (J;US)
**Edwards, D.J.,** Assessment of energy storage for solar applications, 9:2151 (R;US)
**Edwards, R.E. Jr.,** *See* Lin, K.H., 9:1782
**Efferding, L.E.,** Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes, 9:2281 (R;US)
**Efimov, G.V.,** Nonlocal quark model, 9:3815 (RA;SU;In Russian)
**Efimov, V.N.,** Primitives (eigenstates) of six-quark bags with an external pion field, 9:3773 (R;SU;In Russian)
**Efremov, A.V.,** Vector meson spin alignment in the fusion madel, 9:3772 (R;SU;In Russian)
**Egami, R.T.,** *See* Bowen, J.L., 9:2051, 9:2052
**Egan, P.O.,** Muonium, 9:3539 (RA;US)
*See* Howell, R.H., 9:3132
**Eggerdinger, C.,** *See* Preuss, W., 9:2344
**Ehlers, K.W.,** Technique to increase the $H^+$ ion fraction in a multicusp source, 9:4105 (J;US)
**Ehrenson, S.,** Substituent bulk effects on solvation, 9:2989 (J;US)
**Ehsakiya, Sh.M.,** *See* Garsevanishvili, V.R., 9:3949
**Eichele, R.,** Two-dimensional imaging of hotspots in superconducting bridges by low-temperature scanning electron microscopy, 9:3074 (J;US)
**Eichhorn, H.J.,** Results of a pilot-study on neutron-therapy with 600 patients, a condensed report, 9:3375 (RA;HU;In Hungarian, English)
*See* Huettner, J., 9:3377
**Elden, R.,** Circumsolar sky radiation: the flux density of radiation energy originating from the circumsolar sky measured at groundbased stations. Final report, 9:2101 (R;XE)
**Eldes, M.I.,** Pionino: an argument against massless gluino, 9:3839 (R;SU)
**Elmerle, D.,** *See* Linford, G.J., 9:4232
**Elnsweiler, K.F.,** First results from MARK III at SPEAR. MARK III collaboration, 9:3715 (R;US)
**Elsch, J.J.,** Desulfurization with transition metal catalysts, 9:1764 (R;US)
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2907 (J;US)
**Eisele, F.,** Nucleon structure functions, 9:3618 (RA;XC)
**Eisenstein, R.A.,** *See* Barnes, P.D., 9:3877
**Ejima, S.,** *See* Jackson, G.L., 9:4202
**El Nadi, A.M.,** *See* Hiroe, S., 9:4082
**Elam, W.T.,** An x-ray absorption study of the binuclear iron center in deoxyhemerythrin, 9:2946 (J;US)
Structure of the binuclear iron center in hemerythrin by X-ray absorption spectroscopy, 9:2970 (J;US)
**Elder, H.K.,** The effect of accidents on decommissioning waste management for nuclear fuel cycle and nonfuel cycle facilities, 9:2312 (J;US)
**Eldridge, O.C.,** *See* Kulchar, A.G., 9:4079
**Elhaderi, A.E.,** Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3059 (D;US)
**Elias, J.E.,** *See* Ankenbrandt, C., 9:3729
**Eliav, U.,** Multipulse sequences in electron-spin echoes, 9:3221 (J;US)
**Eliezer, S.,** Laser-driven shock wave studies in single and double-layered slab targets, 9:4161 (R;IL)
**Elioff, T.,** *See* Alonso, J.R., 9:3135
**Elitzur, S.,** N = 2 two dimensional Wess-Zumino model on the lattice, 9:3844 (R;IL)
**Elkin, D.J.,** *See* Chu, C.K., 9:4138
**Elliott, G.R.,** *See* Ahmed, N., 9:3106
**Ellis, A.B.,** Excited-state processes of relevance to photoelectrochemistry. Technical report, 9:3004 (R;US)
*See* Hobson, W.S., 9:2105
**Ellis, J.N.,** Control system for a wound-rotor motor, 9:2198 (P;US)
**Ellis, R. Jr.,** *See* Yamada, M., 9:4226
**Ellsaesser, H.W.,** Response to W.W. Kellogg carbon dioxide and climatic

change: implications for mankind's future, 9:3274 (R;US)
**Elmroth, A.,** Air infiltration control in housing. A guide to International Practice, 9:2598 (R;SE)
**Elston, S.B.,** *See* Breinig, M., 9:3561
**Elwell, D.,** *See* Feigelson, R.S., 9:2124
**Elwood, J.W.,** *See* Newbold, J.D., 9:3330, 9:3341
**Emerson, L.C.,** *See* Jackson, G.L., 9:4202
**Emile, B.F.M.,** Process for isotope separation, 9:1924 (TG;US)
**Emin, D.,** *See* Jennison, D.R., 9:2846
**Eng, J.,** States' approach to low-level waste disposal, 9:2016 (J;US)
**Eng, R.L.,** *See* Gates, R.J., 9:3315
*See* Watson, J.W., 9:3323
**Engar, P.,** *See* Breinig, M., 9:3561
**Engebretsen, H.,** *See* Soma, M., 9:2095
**Engelke, R.,** Theoretical study of possible benzene dimerizations under high-pressure conditions, 9:2980 (J;US)
**England, A.C.,** *See* Kulchar, A.G., 9:4079
**Engle, G.B.,** *See* Eatherly, W.P., 9:2254
**Engleman, R. Jr.,** Vacuum predisperser for a large plane-grating spectrograph, 9:3227 (BA;US)
**Engler, J.,** *See* D'Agostini, G., 9:3625
**Englert, P.,** *See* Reedy, R.C., 9:3451
**Engloner, L.,** *See* Konya, A., 9:3364
**Engman, U.,** *See* Holm, T., 9:3117
**Ennis, R.M. Jr.,** *See* Baker, S.P., 9:2282
**Enuls, J.F.,** *See* Gai, M., 9:3934
**Eno, B.E.,** In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program, 9:2625 (R;US)
**Eno, L.,** *See* Chang, B., 9:3575, 9:3593
**Epishin, V.A.,** *See* Berezhnyj, V.L., 9:4076
**Eppenstein, P.,** *See* Rapoport, H., 9:2279
**Eramzhyan, R.A.,** *See* Majling, L., 9:3650
**Erell, A.,** *See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Eremyan, Sh.S.,** Reggeon field theory at D = 2 in two-loop approximation, 9:3744 (R;SU)
Renormalizability of reggeon field theory with account of thresholds and mass terms at D = 2, 9:3743 (R;SU)
**Eriksson, A.,** *See* Andersson, S., 9:2518
**Erler, J.W.,** Nuclear-induced lightning aurora experiment. Technical report, 9:3501 (R;US)
**Erlich, R.,** *See* Avery, P., 9:3718
**Ermak, D.L.,** *See* Chan, S.T., 9:1886
**Ermi, A.M.,** Miniature center-cracked-tension specimen for fatigue crack growth testing, 9:2690 (R;US)
**Ernwein, R.,** *See* Aslanides, E., 9:3171
**Esch, G.W.,** Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3408 (R;US)
*See* Hazen, T.C., 9:3387
**Esik, O.,** *See* Treer, T., 9:3371
**Esparza, C.,** *See* Moraga, L.A., 9:3521
**Espenson, J.H.,** Reactions of bis(dimethylglyoximato)cobalt(II) complexes with tert-butyl hydroperoxide, 9:2985 (J;US)
*See* McDowell, M.S., 9:3027
*See* Muralidharan, S., 9:2926
**Estborn, L.,** Effect of cadmium on transmitter transportation, 9:3411 (R;SE;In Swedish)
**Estill, W.B.,** Porosity decrease in laser welds of stainless steel using plasma control, 9:2712 (R;US)
**Eubank, H.P.,** *See* Schilling, G., 9:4145
**Evans, D.,** *See* Olsen, R.B., 9:2593
**Evans, H.H.,** Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983, 9:3392 (R;US)
**Evans, J.W.,** Irreversible random and cooperative processes on lattices: Exact and approximate hierarchy truncation and solution, 9:2815 (J;US)
Irreversible reaction on a polymer chain with range two cooperative effects, 9:2816 (J;US)
**Evans, N.A.,** *See* Berman, M., 9:2452
**Evans, S.A. Jr.,** *See* Butler, J.J., 9:2987
**Evseev, V.S.,** *See* Balandin, M.P., 9:3538
**Evtukhovich, P.G.,** RASTR special processor design, 9:3186 (R;SU;In Russian)
*See* Baranov, V.A., 9:3187
**Ewetz, L.,** *See* Camner, P., 9:3416
**Exner, P.,** *See* Bednar, M., 9:4038
**Ezaki, Masahiro,** *See* Tadokoro, Yoshihiro, 9:2251

## F

**Fabrikant, J.I.,** Effects of the accident at Three Mile Island on the mental health and behavioral responses of the general population and nuclear workers, 9:2461 (J;GB)
Nuclear energy an unacceptable hazard to health, 9:2460 (J;GB)
**Facon, P.,** Feasibility study on a submerged wave dampener, 9:1835 (BA;GB)
**Fahrenbruch, A.L.,** *See* Werthen, J.G., 9:2849
**Fairweather, D.S.,** *See* Bateman, J.E., 9:3383
**Fajfman, M.P.,** *See* Bakalov, D.D., 9:3639
**Fakirov, D.G.,** Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons, 9:3753 (R;XA)
**Falcimaigne, J.,** Design of two storage and loading floating platforms, 9:1837 (BA;GB)
**Falco, C.M.,** Artifically layered superconductors. Annual progress report, 9:2683 (R;US)
**Falicov, L.M.,** *See* Haller, E.E., 9:2851
**Falk, J.,** Test of fidelity of phase conjugation, 9:4035 (J;US)
**Fallon, W.E.,** *See* Becker, C.D., 9:3424
**Fan, L.T.,** *See* Lee, Y.H., 9:2132
**Fanjas, Y.,** Contribution of French industry to RERTR (state of development in September 1980), 9:2362 (RA;US)
**Fannin, K.F.,** Marine biomass program: anaerobic digestion systems development and stability study. Final report 1 Feb-31 Dec 82, 9:2085 (R;US)
**Farias, M.H.,** *See* Garfunkel, E.L., 9:2932
*See* Pena, J.L., 9:2893
**Farkas, J.,** *See* Petranyi, J., 9:3374
**Farkas, Z.,** Some aspects of superconducting accelerator design, 9:3128 (J;US)
**Farneth, W.D.,** Infrared laser induced heterogeneous reactions: 2-propanol with cupric oxide, 9:3026 (J;US)
**Farneth, W.E.,** Infrared photochemistry of specifically deuterated bicyclopropyl. A direct test of statistical unimolecular rate theory applied to branching ratios in multiphoton dissociation, 9:3019 (J;US)
**Farr, A.P. Jr.,** Tool joint design and operating torque, 9:3071 (R;US)
**Farrington, G.C.,** High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983, 9:2524 (R;US)
**Faskel, B.G.,** Transforming design concepts into energy-conscious architecture, 9:2606 (RA;DE;In German)
**Fassel, V.A.,** *See* Capellen, J.M., 9:2096
*See* Houk, R.S., 9:3609
**Fassnacht, P.,** *See* Aslanides, E., 9:3171
**Fast, R.,** *See* Wands, R., 9:3079
**Faustov, R.N.,** Present state of quantum electrodynamics, 9:3836 (RA;SU;In Russian)
**Favorskij, A.P.,** *See* Bol'shov, L.A., 9:4163
**Fawcett, B.C.,** Atomic structure Hartree-Fock-relativistic and Hartree-XR program-package translated for IBM from the Cowan-CDC version, plus the Zeeman parameter optimisation routines, 9:3543 (R;US)
**Fearey, B.L.,** Efficient nonphotochemical hole burning of dye molecules in polymers, 9:2983 (J;US)
**Fechner, W.B.,** *See* Tarvin, J.A., 9:4201
**Federer, J.I.,** Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2654 (R;US)
**Fedoseev, I.A.,** Heisenberg operators of generalized Toda lattice, 9:4008 (R;SU)
**Fedro, A.J.,** Resonance and pairing effects in the Anderson lattice, 9:3996 (BA;US)
**Fedyanin, V.K.,** *See* Adam, G., 9:2829
**Feibelman, P.J.,** Electronic structure of metal overlayers on rhodium, 9:2724 (J;US)
**Feigelson, R.S.,** Materials for high-temperature thermoelectric conversion, 9:2124 (R;US)
**Feinberg, D.,** *See* Parker, S., 9:2090
**Feit, M.D.,** Comparison of calculated and measured performance of diffused channel-waveguide couplers, 9:4026 (J;US)
**Feldman, E.E.,** *See* Chang, L.K., 9:2301
**Feldman, G.J.,** *See* Franklin, M.E.B., 9:3726
*See* Jaros, J.A., 9:3724
**Feldman, P.S.,** *See* Carrier, G.F., 9:3236
**Feldman, W.C.,** *See* Bame, S.J., 9:3506
*See* Lemons, D.S., 9:3481
**Felmus, N.L.,** Experience in transfer of BWR maintenance technology, 9:2478 (J;US)
**Felter, T.E.,** *See* Hess, B.V., 9:3105
**Fendell, F.,** *See* Carrier, G., 9:3244
**Fendell, F.E.,** *See* Carrier, G.F., 9:3236
**Fendler, J.H.,** *See* Kurihara, K., 9:2929, 9:3016
**Feng, X.,** *See* Melendres, C.A., 9:2939

**Fenimore, E.E.,** *See* Klebesadel, R.W., 9:3454
**Fenker, H.,** *See* Jenkins, C.M., 9:3727
**Fenn, J.B.,** *See* Mantell, D.A., 9:3587
**Feraday, M.A.,** Development of lower enrichment fuels for Canadian research reactors, 9:2363 (RA;US)
**Ferbel, T.,** *See* McLaughlin, M., 9:3725
**Ferguson, T.,** *See* Avery, P., 9:3718
**Fernandez, E.,** Lifetime of particles containing b quarks, 9:3723 (J;US)
**Fernsebner, M.,** Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3380 (R;DE;In German)
**Ferraudi, G.,** *See* Ebbesen, T.W., 9:3015
**Ferrieri, R.A.,** $CF_4$-$H_2$-Ne gas target for reproducible high yields of anhydrous $H^{18}F$, 9:3051 (J;GB)
On-line production of ($^{13}N$)-nitrogen from solid enriched ($^{13}C$)-targets, and its application to ($^{13}N$)-ammonia synthesis using microwave radiation, 9:3050 (J;GB)
**Feshchenko, A.A.,** *See* Strmen, P., 9:3183
**Fessenden, T.J.,** *See* Chong, Y.P., 9:3143
**Fetisov, V.N.,** *See* Majling, L., 9:3650
**Fiala, C.,** *See* Seidensticker, R.W., 9:2302
**Fidone, I.,** Quasilinear saturation effects on electron cyclotron wave damping of the ordinary mode in tokamak plasmas, 9:4087 (J;US)
**Field, R.W.,** *See* Kittrell, C., 9:3580
**Filatov, O.G.,** Numerical simulation of the operation regimes of the poloidal field system of a tokamak reactor, 9:4186 (R;SU;In Russian)
**Filipovich, M.A.,** Small mammal density and movement on the SL-1 disposal area, Idaho National Engineering Laboratory, 9:3297 (RA;US)
**Fillo, J.A.,** *See* Varljen, T.C., 9:4209
**Filter, H.E.,** Utilizing existing technology to improve environmental protection, 9:2021 (J;US)
**Finger, F.,** *See* Altmann, J., 9:1941
**Fink, J.H.,** Photodetachment technology, 9:4199 (R;US)
**Fink, J.K.,** Calculation of thermophysical properties of sodium, 9:2775 (BA;US)
Consistency in thermophysical properties: enthalpy, heat capacity, thermal conductivity and thermal diffusivity of solid $UO_2$, 9:1931 (BA;US)
**Finley, C.W.,** *See* Kestner, N.R., 9:2944
**Finn, P.,** *See* Baker, C., 9:4219
**Finsterwalder, K.,** Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas, 9:1840 (BA;GB)
**Finsterwalder, L.,** Handling and storage of high-level liquid wastes from reprocessing of spent fuel, 9:1967 (R;DE)
**Fischer, C.F.,** Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3517 (R;US)
**Fischer, R.D.,** *See* Ball, D.A., 9:2629
**Fischer, S.M.,** Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism, 9:3428 (J;US)
**Fischer, U.,** Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN, 9:1938 (TG;US)
**Fischler, M.,** Detailed calculation of the complete two-loop Higgs-Yukawa beta function in an arbitrary $\alpha$ gauge, 9:3784 (J;US)
**Fisher, A.T.,** *See* Sklad, P.S., 9:2803
**Fisher, D.R.,** Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen, 9:3397 (J;GB)
**Fisk, H.,** *See* Cooper, W., 9:3129
**Fisk, Z.,** *See* Guentherodt, G., 9:2753
*See* Molnar, S. von, 9:2799
*See* Ott, H.R., 9:2711
*See* Smith, J.L., 9:2741
**Fittipaldi, I.P.,** *See* Sarmento, E.F., 9:3523
**Fitzpatrick, B.J.,** *See* Goldman, A.I., 9:2844
**FitzPatrick, V.F.,** In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:2004 (R;US)
*See* Oma, K.H., 9:2002
**Flake, L.D.,** *See* Browers, H.W. Jr., 9:3338, 9:3348
**Flakus, F.N.,** Past IAEA activities in the area of fusion safety. A brief overview, 9:4164 (RA;XA)
**Flambaum, V.V.,** P-odd nuclear forces are a source of parity violation in atom, 9:3818 (RA;SU;In Russian)
**Flanagan, J.,** *See* Buchanan, M.V., 9:1788
**Fleck, J.A. Jr.,** *See* Feit, M.D., 9:4026
**Fleeter, R.,** *See* Carrier, G., 9:3244
**Fleming, D.K.,** *See* Hill, A.H., 9:1779
**Flesher, A.C.,** *See* Bateman, J.E., 9:3383
**Fletcher, E.A.,** *See* Noring, J.E., 9:2135
**Fletcher, J.,** *See* Narayan, J., 9:2878
**Fliege, E.,** Centrifugal distortion and internal rotation analysis of the microwave spectrum of ethyl fluoride, 9:3579 (J;US)
**Flicrmans, C.B.,** *See* Orrison, L.H., 9:3386
**Flood, C.W. Jr.,** Radiation safety systems at Brookhaven National Laboratory's low-energy accelerators, 9:3134 (J;US)
**Florin, R.E.,** *See* Senich, G.A., 9:3033
**Flotow, H.E.,** *See* Rotella, F.J., 9:2715
**Flouquet, J.,** *See* Molnar, S. von, 9:2799
**Floyd, D.A.,** Baseline vegetation data for a controlled burn site, 9:3284 (RA;US)
Comparison of three methods for estimating vegetal cover, 9:3308 (RA;US)
New point interception frame for estimating cover of vegetation, 9:3282 (RA;US)
**Fluegge, G.,** *See* D'Agostini, G., 9:3625
**Fluss, M.J.,** Temperature-dependent behavior of positron annihilation in metals, 9:2772 (BA;US)
**Flynn, G.W.,** *See* Ahl, J.L., 9:3584
*See* Chu, J.O., 9:3592
**Flynn, T.M.,** *See* Way, J.D., 9:1880
**Fogler, R.J.,** *See* Ahmed, N., 9:3106
**Foglia, M.,** Radionuclide migration in transport paths bounded by the environment, 9:2026 (J;US)
**Foias, C.,** New representation of Navier-Stokes equations governing self-similar homogeneous turbulence, 9:3611 (J;US)
**Fokin, A.P.,** *See* Golovkin, S.I., 9:3382
**Foo, M.T.,** *See* Feraday, M.A., 9:2363
**Foosnaes, T.,** Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices, 9:3590 (J;US)
**Forand, J.L.,** *See* Mitchell, J.B.A., 9:3565
**Ford, A.,** Using simulation for policy evaluation in the electric utility industry, 9:2575 (J;US)
**Ford, G.W.,** *See* Khandker, A., 9:4128
**Ford, J.E.,** Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2927 (J;US)
**Ford, J.L.C.,** Heavy ions, targets, and research at HHIRF, 9:3147 (R;US)
**Ford, J.L.C. Jr.,** *See* Shapira, D., 9:3887
**Ford, P.C.,** *See* Walker, H.W., 9:2961
**Ford, W.T.,** *See* Fernandez, E., 9:3723
**Fordham, E.W.,** *See* Rayudu, G.V.S., 9:3047
**Formisano, B.D.,** *See* Estill, W.B., 9:2712
**Forsberg, B.,** *See* Nordstroem, S., 9:3414
**Forsgren, M.,** Test plant for wind power Kalkugnen 1977-1980. Summary of operation results, 9:2189 (R;SE;In Swedish)
**Fortgang, C.M.,** *See* Callen, J.D., 9:4133
**Fossan, D.B.,** *See* Dybdal, K., 9:3932
**Foster, C.A.,** *See* Milora, S.L., 9:4230
*See* Schuresko, D.D., 9:4152
**Fournie, R.,** Deep sea repair of pipelines by mechanical coupling, 9:1865 (BA;GB)
*See* Vedrenne, J.P., 9:1899
**Fowler, J.S.,** *See* Ferrieri, R.A., 9:3051
**Fowler, T.B.,** *See* Vondy, D.R., 9:2331
**Fowler, W.A.,** *See* Matthews, G.J., 9:3485
**Fradkin, E.S.,** Grand unified asymptotic-free model, 9:3837 (RA;SU;In Russian)
**Frajndlich, R.,** Calculation of the probability to occur accidents at IEA-R1 reactor, 9:2402 (B;BR;In Portuguese)
**Fraley, L. Jr.,** *See* Kuzo, G.B., 9:3335
**France, D.M.,** Experimental evidence suppporting two-mechanism critical heat flux, 9:2216 (J;GB)
**Franey, M.A.,** *See* Seestrom-Morris, S.J., 9:3888
**Frankham, S.A.,** Materials behaviour in the liquid alkali metals lithium and sodium, 9:2748 (B;GB)
**Franklin, G.,** *See* Barnes, P.D., 9:3877
**Franklin, M.E.B.,** Measurement of psi(3097) and pai'(3686) decays into selected hadronic modes, 9:3726 (J;US)
**Frascaria, N.,** Some aspects of recent progress in the study of giant resonances, 9:3906 (R;FR;In French)
**Fraser, H.L.,** Determination of symmetry changes in ordered alloys by convergent beam electron diffraction, 9:2754 (BA;US)
*See* Konitzer, D.G., 9:2755
**Frazer, B.C.,** *See* Moodenbaugh, A.R., 9:2931
**Frazier, G.C.,** *See* Lin, K.H., 9:1782
**Frazier, M.E.,** *See* Wilson, B.W., 9:1817, 9:3420
**Frederick, F.P.,** *See* Dickson, J.C., 9:2647
**Freed, J.H.,** *See* Eliav, U., 9:3221
*See* Tatsumi, K., 9:2938
**Freeman, A.J.,** *See* Wimmer, E., 9:2723
**Freeman, R.S.,** *See* Matzie, R.A., 9:2235
**Freiser, B.S.,** *See* Sallans, L., 9:3035
**Frekers, D.,** Half-life of $^{44}Ti$, 9:3893 (J;US)
**French, H.,** *See* Baker, N.J., 9:3731

**Frenk, C.S.,** Nonlinear evolution of large-scale structure in the universe, 9:3484 (J;US)
**Frenkel, A.L.,** *See* Babchin, A.J., 9:3991
**Frenkel, D.,** *See* Allen, M.P., 9:3993
**Frese, K.W. Jr,** Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83, 9:2081 (R;US)
**Freshley, M.D.,** Summary results of the LOCA Simulation Program conducted in NRU, 9:2450 (R;US)
**Frevert, E.,** Radioisotope applications in industry. Part 2: Practical applications, 9:3195 (R;AT;In German)
**Freytag, L.,** *See* Eichele, R., 9:3074
**Friar, J.L.,** Configuration space Faddeev continuum calculations: p-d s-wave scattering length, 9:3874 (J;US)
Deuteron forward photodisintegration: meson currents and relativity, 9:3872 (R;US)
**Fried, B.D.,** *See* Dawson, J.M., 9:4139
**Friedland, S.S.,** *See* Davidson, H.L., 9:4252
**Friedman, A.,** *See* Langdon, A.B., 9:4127
**Friedman, L.,** Magic numbers for argon and nitrogen cluster ions, 9:3576 (J;US)
**Friedman, S.D.,** *See* Smoot, G.F., 9:3477
**Fries, D.C.,** *See* D'Agostini, G., 9:3625
**Friman, B.L.,** Calculations of pion excess in nuclei, 9:3958 (J;US)
**Frishman, Y.,** Fractional charge and anomalous commutators, 9:3846 (R;IL)
**Frisoli, J.K.,** *See* Jasinski, J.M., 9:3011
**Fritz, I.J.,** Electron mobilities in In/sub 0.2/Ga/sub 0.8/As/GaAs strained-layer superlattices, 9:2845 (J;US)
Soft acoustic mode in thallium arsenic sulphide $Tl_3AsS_4$, 9:2879 (J;GB)
**Frontas'eva, M.V.,** *See* Balandin, M.P., 9:3538
**Frost, J.C.,** *See* Garfunkel, E.L., 9:2932
**Frotscher, H.,** Processing of irradiated fuel cans by rolling and embedding in concrete (Final report Nov 1976-Jul 1980), 9:1956 (R;XE;In German)
**Froyen, S.,** Structural properties of III-V zinc-blende semiconductors under pressure, 9:2854 (J;US)
**Fry, J.N.,** Correlation functions in a filamentary clustering prescription, 9:3486 (J;US)
Cosmological effects of primeval fermion degeneracy in the grand unified theories, 9:3492 (J;US)
Four-point function in the BBGKY hierarchy, 9:3494 (J;US)
**Fu, C.,** Renormalization of the H-point phonon anomaly in molybdenum, 9:2721 (J;US)
**Fucho, P.,** Density of states, Poisson's formula of summation and Walfisz's formula, 9:3751 (R;XA)
**Fuchs, R.,** *See* Barrera, R.G., 9:2702
*See* Mochan, W.L., 9:3994
**Fuerst, R.G.,** *See* Streib, E.W., 9:3281
**Fues, W.,** *See* D'Agostini, G., 9:3625
**Fujiki, Kazuo,** Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3, 9:2439 (R;JP)
**Fujimura, K.S.,** *See* Miliaras, E.S., 9:2190
**Fujiwara, K.,** Quality assurance activities of PWR plants in Japan, 9:2240 (J;US)
**Fukada, E.,** Ferroelectricity of polymers, 9:2813 (RA;BR)
**Fulkerson, E.S.,** Inexpensive solid-state trigger unit for thyratrons, 9:3108 (R;US)
**Fullwood, R.R.,** Error analysis of nuclear waste migration, 9:2027 (J;US)
**Fulrath, R.M.,** *See* Biswas, D.R., 9:2806
**Funasaka, H.,** *See* Sawamura, O., 9:2424
**Funsten, H.O.,** Measurement of $^{13}C$ magnetic moment, 9:3647 (RA;US)
**Furst, D.A.,** *See* Vickis, A.C., 9:1970
**Furth, H.P.,** *See* Kulsrud, R.M., 9:4134
*See* Yamada, M., 9:4226
**Furukane, Utaro,** Population inversion in an optically thick recombining hydrogen plasma, 9:4063 (R;JP)
**Furuta, Teruo,** *See* Motohashi, Haruhiko, 9:2339

## G

**Gaal, J.,** *See* Hirling, J., 9:3121
**Gabites, J.E.,** Argon analytical procedures for potassium-argon dating, 9:3434 (R;NZ)
**Gaffney, J.S.,** *See* Olson, J.M., 9:3352
**Gai, M.,** Molecular alpha-particle clustering in $^{218}Ra$; dipole collectivity in the vicinity of nuclear shell closures, 9:3934 (J;US)
**Gajsler, V.A.,** Raman scattering study of $HgI_2$ crystal structure perfection, 9:2830 (RA;SU;In Russian)
**Gal, A.,** *See* Auerbach, E.H., 9:3793
**Gal, J.,** *See* Buvet, R., 9:2966
**Galbraith, H.W.,** Chaos in the multiple photon excitation of molecules due to vibration-rotation coupling at lowest order, 9:3550 (J;US)
*See* Ackerhalt, J.R., 9:3562
**Galeao, A.P.N.R.,** *See* Nakayama, K., 9:3947
**Galik, R.,** *See* Avery, P., 9:3718
**Gallagher, A.,** Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, July 15, 1982-October 14, 1982, 9:2126 (R;US)
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, October 15, 1982-January 14, 1983, 9:2127 (R;US)
**Gallier, P.W.,** Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1767 (R;US)
**Galvao, R.M.O.,** Beat-wave current drive in a magnetized plasma, 9:4054 (R;US)
**Galvin, G.J.,** Time-resolved conductance and reflectance measurements of silicon during pulsed-laser annealing, 9:2874 (J;US)
**Gamerdinger, K.,** *See* D'Agostini, G., 9:3625
**Gammage, R.B.,** *See* Schuresko, D.D., 9:3269
**Ganapol, B.D.,** Breeder reactor engineering education at the University of Arizona, 9:2293 (J;US)
**Gandhi, O.P.,** Biological effects of millimeter-wave irradiation. Final report 15 May 81-30 Jun 82, 9:3429 (R;US)
**Gandhi, P.D.,** *See* Kanury, A.M., 9:3054
**Gangl, M.,** *See* Hick, H., 9:3100
**Gann, V.V.,** State and problems of scientific research automation in radiation damage physics in KFTI, 9:2548 (RA;SU;In Russian)
**Garbow, J.R.,** Total spin coherence transfer echo spectroscopy, 9:2905 (J;US)
**Garcia, A. III,** Development of metallization process: FSA Project, cell, and module-formation research area. Quarterly technical progress report No. 6329-15 for the period ending June 30, 1983, 9:2108 (R;US)
**Garcia, E.,** *See* Gonzalez, C.O. de, 9:2782
**Garcia Santibanez, F.,** *See* Oliver, A., 9:2701
**Gardiner, D.C.,** *See* Davison, P., 9:1847
**Gardiner, G.H.,** RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2092 (R;US)
**Gardner, J.,** *See* Colombant, D.G., 9:4123
*See* Herbst, M.J., 9:4191
**Gardner, R.H.,** Robust analysis of aggregation error, 9:3349 (J;US)
**Garelick, D.,** *See* McLaughlin, M., 9:3725
**Garelis, E.,** Numerical solution to the steady state equation of transfer in azimuthally symmetric geometries, 9:3089 (R;US)
**Garfunkel, E.L.,** Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2932 (J;US)
**Garren, A.,** *See* Alonso, J.R., 9:3135
**Garren, L.,** *See* Alam, M.S., 9:3719
**Garrett, B.C.,** Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+\ ^{35}Cl$, 9:2949 (J;US)
*See* Blais, N.C., 9:2959
*See* Truhlar, D.G., 9:2937
**Garsevanishvili, V.R.,** Deep inelastic lepton-nuclear interactions, 9:3949 (RA;SU;In Russian)
**Garthwaite, F.G.L.,** Calculation of the shielding effect of solid shell enclosures, 9:3964 (R;GB)
**Gary, S.P.,** Microinstabilities in the high latitude F region: a brief review, 9:3504 (R;US)
**Garzarolli, F.,** BWR fuel channels performance up to 2000 EFPD, 9:2215 (J;US)
**Gaspar, P.P.,** Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2914 (R;US)
**Gates, R.J.,** Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory, 9:3315 (RA;US)
*See* Arthur, W.J., 9:3285
**Gavrilenko, G.M.,** *See* Adam, G., 9:2829
**Gavron, A.,** Muon-induced fission, 9:3939 (RA;US)
**Gaw, J.F.,** *See* Yamaguchi, Y., 9:3586
**Geaga, J.V.,** *See* Smith, A.R., 9:3885
**Gearhart, R.A.,** *See* Kawabata, S., 9:3198
**Geenen, G.,** *See* Voorde, N. van de, 9:1955
**Gehlen, P.C.,** *See* Cheverton, R.D., 9:2243

**Gehre, G.,** Evaluation of neutron flux density and power density with SPN-detectors and micro calorimeters. A comparison, 9:2213 (R;DD)
**Gehrels, N.,** Upper limits to the annihilation radiation luminosity of Centaurus A, 9:3467 (R;US)
**Geist, W.,** Charm physics at the SPS; Now until approximately 1990, 9:3620 (RA;XC)
**Geller, R.,** *See* Delaunay, M., 9:4231
**Gelmini, G.B.,** Does nature like Nambu-Goldstone bosons, 9:3810 (R;XA)
**Gely, M.H.,** Low temperature irradiations of iridium and of the compound $Nb_3Ge$, 9:2678 (R;FR;In French)
**George, L.L.,** What good is Operations Research after an emergency, 9:4245 (RA;US)
**George, T.F.,** *See* Huang, X., 9:3511
**Gepner, D.,** *See* Frishman, Y., 9:3846
**Gerberich, W.W.,** Quantitative fractography and dislocation interpretations of the cyclic cleavage crack growth process, 9:2736 (J;US)
**Germain, P.,** *See* Masson, M., 9:3292
**Gertis, K.,** Collecting environmental energy with construction, 9:2144 (RA;DE;In German)
**Gesi, Kazuo,** Reflection of low-energy light-element ions from solid surfaces, 9:4173 (RA;JP)
**Geusic, M.E.,** *See* Powers, D.E., 9:3588
**Gevorkyan, S.R.,** Inclusive spectra of hadrons in photon-nucleus collisions, 9:3742 (R;SU)
**Ghiglia, D.C.,** Binary multiplexing and the phase-retrieval problem, 9:4034 (J;US)
**Ghose, P.,** Approach to gauge hierarchy in the minimal SU(5) model of grand unification, 9:3807 (R;XA)
Scalar loops and the Higgs mass in the Salam-Weinberg-Glashow model, 9:3808 (R;XA)
**Ghosh, A.,** *See* Smith, R.J., 9:2722
**Giannotti, C.,** *See* Chandrasekaran, K., 9:3028
*See* Schanze, K.S., 9:3009
**Gibbs, G.V.,** *See* Newton, M.D., 9:2886
**Gibbs, W.R.,** Meson-nucleon systems, 9:3672 (RA;US)
New horizons in nuclear physics, 9:3864 (RA;US)
Nuclear structure and nuclear reactions, 9:3908 (RA;US)
*See* Bonner, B.E., 9:3658
*See* Kaufmann, W.B., 9:3886
**Gibson, B.F.,** Hypernuclei, 9:3642 (RA;US)
Hyperon-nucleon interactions, 9:3665 (RA;US)
*See* Friar, J.L., 9:3874
*See* Gibbs, W.R., 9:3908
**Gibson, G.W.,** Concreting of incinerated simulated TRU wastes, 9:2040 (J;US)
**Gidal, G.,** *See* Carr, J., 9:3735
**Giese, R.F.,** *See* Asbury, J.G., 9:2620
**Gietzen, A.J.,** Improved capability of U-ZrH fuels, 9:2359 (RA;US)
**Gignac, W.,** *See* Allen, M.P., 9:3993
**Gijbels, J.,** *See* Voorde, N. van de, 9:1955
**Gil, F.B.,** *See* Soares, J.C., 9:3926
**Gilbert, K.V.,** A technology implementation perspective on defense transuranic waste management, 9:2034 (J;US)
**Gilbert, M.A.,** *See* Broga, D.W., 9:3396
**Gilchriese, M.G.D.,** *See* Avery, P., 9:3718
**Giles, R.,** *See* Alam, M.S., 9:3719
**Giles, R.C.,** *See* Brower, R.C., 9:3853
**Gili, R.L.,** *See* Clark, D.D., 9:3905
*See* Schmid, M., 9:3161
*See* Wohn, F.K., 9:3918
**Gillespie, C.H.,** *See* Bingham, G.E., 9:2906
**Gillespie, G.E.,** Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2425 (RA;CA)
**Gillespie, T.J.,** Troubleshooting the General Electric Company Neutron Devices Department's deionized water system, 9:2071 (R;US)
**Gillett, B.E.,** *See* Rountree, S.L.K., 9:4257
**Ginley, D.S.,** *See* Butler, M.A., 9:2131
**Ginocchio, J.N.,** *See* Gibbs, W.R., 9:3864, 9:3908
**Giorsetti, D.,** LEU fuel development activities in Argentina, 9:2366 (RA;US)
**Giovanetti, K.L.,** *See* Hertzog, D.W., 9:3721
**Girardot-Verdenet, J.,** Temporal functional analysis of dynamic scintigraphy by application of the Karhunen-Loeve transform, 9:3357 (R;FR;In French)
**Giri, A.H.,** *See* Varacalle, D.J. Jr., 9:2411
**Girotti, H.O.,** Equal-time commutation relations for non-abelian gauge field theories and Dirac brackets, 9:4011 (R;BR)
*See* Costa, M.E.V., 9:4012
**Gitter, L.,** *See* Eliezer, S., 9:4161
**Gittleman, B.,** *See* Avery, P., 9:3718
**Giuffrida, M.,** *See* Pizzini, S., 9:2137
**Gladney, E.S.,** *See* Berg, W.W., 9:3276
**Gladysz, J.A.,** *See* Hatton, W.G., 9:2930
**Glass, G.,** Glueballs, 9:3678 (RA;US)
p anti $p \rightarrow l^+l^-$: a LAMPF II proposal, 9:3662 (RA;US)
*See* Bhatia, T.S., 9:3676
*See* McLaughlin, M., 9:3725
**Glasser, A.H.,** *See* Dewar, R.L., 9:4119
**Glatzmaier, G.A.,** Numerical simulations of convectively excited gravity waves, 9:3457 (R;US)
**Glazkov, Yu.Yu.,** Measuring background by the DIN-1M spectrometer using the oscillating absorbing screen method, 9:3173 (R;SU;In Russian)
**Glebov, V.I.,** *See* Avakyan, A.P., 9:3965
**Glen, J.S.,** *See* Hilborn, J.W., 9:2387
**Glushak, N.S.,** Complex of hardware and software means for fission product detection in the fast reactor sodium coolant and cover gas, 9:2393 (R;SU;In Russian)
**GLushak, S.M.,** *See* Glushak, N.S., 9:2393
**Gminder, R.,** *See* Phillips, J.C., 9:3333
**Gneiting, B.C.,** *See* Biancheria, A., 9:2297
**Gobbi, B.,** *See* Carr, J., 9:3735
**Godbee, H.,** *See* Schultz, W.W., 9:2892
**Godbole, S.,** *See* Albal, R., 9:1768
**Goddard, W.A. III,** *See* Redondo, A., 9:2969
**Godot, J.M.,** *See* Berget, G., 9:3356
**Goeltz, R.,** *See* Hirst, E., 9:2628
**Goertzen, A.,** *See* Kartes, H., 9:1954
**Gold, R.,** *See* Ruddy, F.H., 9:2205, 9:2338
**Gold, T.,** Studies related to the deep earth gas. Annual report Jan-Dec 82, 9:1877 (R;US)
**Goldberg, M.,** *See* Chen, A., 9:3736
**Goldflam, R.,** *See* Wilets, L., 9:3741
**Goldhaber, A.S.,** *See* Rho, M., 9:3789
**Goldhaber, M.,** *See* Kulsrud, R.M., 9:4134
**Goldiwre, H.C. Jr.,** *See* Koopman, R.P., 9:1885
**Goldman, A.I.,** Extended x-ray absorption fine structure studies of diffused copper impurities in ZnSe, 9:2844 (J;US)
**Goldman, J.H.,** *See* Jenkins, C.M., 9:3727
**Goldman, M.I.,** Development of preliminary radionuclide mass balance for the TMI-2 accident, 9:2463 (J;US)
**Goldman, T.,** Electroweak interactions, 9:3679 (RA;US)
Hyperon decays, 9:3697 (RA;US)
Kaon decays, 9:3691 (RA;US)
**Goldston, R.J.,** *See* White, R.B., 9:4117
**Goldstone, J.A.,** *See* Howard, J., 9:3975
**Goldwire, H.C.,** *See* Bingham, G.E., 9:2906
**Golinelli, C.,** Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report, 9:2202 (R;XE;In French)
Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings, 9:2203 (R;XE)
**Goloskokov, S.V.,** Large-angle hadron scattering at high energies, 9:3767 (RA;SU;In Russian)
**Golovkin, S.I.,** Significance of determination of the efficient renal plasma circulation and glomerular filtration in evaluation of early changes of kidney functional state during "non-complicated" skeletal trauma in children, 9:3381 (RA;SU;In Russian)
Significance of radioisotope and other investigational methods in definition of functional changes of different organs during some types of "non-complicated" skeletal trauma in children, 9:3382 (RA;SU;In Russian)
**Golubev, I.I.,** *See* Viktorov, Yu.B., 9:3141
**Golubinskij, P.K.,** Fluctuation and radiation processes in bounded plasma-molecular systems, 9:4075 (R;SU;In Russian)
**Gomer, R.,** *See* Jensen, K.A., 9:3487
**Gomez Alonso, M.,** Core optimization studies at JEN - Spain, 9:2379 (RA;US)
**Gonczy, J.,** *See* Smith, R., 9:3077
**Gonzalez, C.O. de,** Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2782 (RA;BR;In Spanish)
**Gonzalez, R.,** *See* Chen, Y., 9:2792
**Goode, W.E.,** *See* Horning, R.R., 9:4260
**Goodin, D.,** *See* Kovacs, W.J., 9:2244
**Goodman, E.M.,** Elf (extremely low frequency) communications system ecological monitoring program. The effects of exposing the slime mold Physarum polycephalum to electromagnetic fields, 9:3431 (R;US)
**Goodwin, J.G. Jr.,** *See* Chen, Y.W., 9:2087
**Goossens, W.R.A.,** *See* Klein, M., 9:1960
**Gordejchik, A.G.,** *See* Burtsev, V.A., 9:4078
**Gordon, H.,** Calculation of spectrum line emission from plasmas, 9:4042 (R;GB)
**Gordon, J.D.,** p-$^{11}$B multipole evaluation, 9:2067 (BA;XA)

**Gordon, R.J.**, *See* Miller, J.C., 9:2955
**Gordon, R.S.**, *See* Shetty, D.K., 9:2805
**Gorham, L.S.**, *See* Sullivan, M.F., 9:3402
**Gosling, J.T.**, *See* Bame, S.J., 9:3506
*See* Sckopke, N., 9:3507
**Gosselin, J.C.**, *See* Dorel, M., 9:1832
**Gotlieb, M.**, *See* Fritz, I.J., 9:2879
**Gotoda, Masao**, *See* Sakumoto, Akihisa, 9:2708
**Gough, R.A.**, *See* Alonso, J.R., 9:3135
**Gough, S.B.**, *See* Orrison, L.H., 9:3386
**Gouraud, O.**, *See* Levallois, E., 9:1863
**Gourley, P.L.**, *See* Pike, G.E., 9:2841
**Grace, R.**, *See* Barnes, P.D., 9:3645
**Graebner, H.**, *See* Frotscher, H., 9:1956
**Graetzel, M.**, *See* Hatlee, M.D., 9:2999
**Graham, W.B.**, *See* Holmes, N.C., 9:3545
**Gran, S.**, Season variations of wave power in Norway, 9:2184 (R;NO)
Wave motion and energy transmission derived from wave records, 9:2185 (R;NO)
**Granata, G.**, *See* Fidone, I., 9:4087
**Grande, L.**, *See* Olden, L.R., 9:1979
**Grande, O.S.**, Digital substation control systems in the electricity supply. System description, 9:2197 (R;NO;In Norwegian)
**Grant, D.M.**, *See* Pugmire, R.J., 9:1787
**Grant, J.C.**, Black-tailed jack rabbit movements and habitat utilization at the Idaho National Engineering Laboratory radioactive waste management complex, 9:3301 (RA;US)
*See* Arthur, W.J., 9:3298
**Grape, W.**, Spectroscopic investigations of uranium(V) complexes with the coordination number six and eight, 9:3040 (R;DE;In German)
**Graner, A.D.**, *See* Jensen, K.A., 9:3487
**Gray, H.B.**, *See* Maverick, A.W., 9:2947
**Gray, J.H.**, H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1760 (R;US)
**Grebenyuk, V.M.**, Two-channel time-to-digital converter, 9:3210 (R;SU;In Russian)
**Greco, C.C.**, *See* Walther, J.F., 9:2525
**Green, A.K.**, *See* Rosenberg, R.A., 9:2936
**Green, L.**, *See* Miller, R.L., 9:4184
**Greenberg, W.**, Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982, 9:3976 (J;US)
**Greene, M.A.**, *See* Matzie, R.A., 9:2235
**Greene, R.T.**, *See* Swaja, R.E., 9:3980
**Greenebaum, B.**, *See* Goodman, E.M., 9:3431
**Greenly, J.B.**, *See* Bluhm, H., 9:4229
**Greer, D.L.**, *See* Williams, J.M., 9:2819
**Gregg, D.W.**, Initial specifications for nuclear waste package external dimensions and materials, 9:2005 (R;US)
**Greiner, D.E.**, *See* Olson, D.L., 9:3883
**Grenier, M.**, *See* Collin, W., 9:1929
**Grev, R.S.**, *See* Truhlar, D.G., 9:2937
**Gribkov, V.M.**, Transport factors due to the dissipative ballooning models, 9:4059 (R;SU;In Russian)
**Griem, H.R.**, *See* McLean, E.A., 9:4190
**Grieme, M.T.**, *See* Webster, R.D., 9:1818
**Griesen, B.**, Interactions between the line-connected static convertors of TEXTOR, 9:4233 (BA;GB)
**Griess, J.C.**, Long term corrosion of Cr-Mo steels in superheated steam at 482 and 538 C, 9:2749 (J;US)
**Griest, W.H.**, *See* Tomkins, B.A., 9:2890
**Grimm, R.**, *See* Izzo, R., 9:4120
**Grimm, R.C.**, *See* Anania, G., 9:4140
**Grimson, J.**, *See* Wands, R., 9:3079
**Grisham, L.R.**, *See* Schilling, G., 9:4145
**Grishin, V.G.**, *See* Angelov, N., 9:3636
*See* Angelov, N.S., 9:3637
**Grisollet, J.**, *See* Laviron, A., 9:3207
**Grist, D.M.**, *See* Davison, P., 9:1847
**Gritton, D.G.**, *See* Whitham, K., 9:4195
**Groebner, R.J.**, Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer, 9:4085 (J;US)
**Groiway, C.M.**, *See* Feraday, M.A., 9:2363
**Gross, D.**, *See* Cooper, W., 9:3129
**Gross, E.E.**, *See* Tinsley, J.R., 9:3933
**Grossette, J.C.**, Optimization technique applied to interpretation of experimental data and research of constitutive laws, 9:2685 (R;XE)
**Grossin, M.**, *See* Grouvel, J.M., 9:1862
**Grossman, B.**, Time delay and the dyon charge, 9:3786 (J;US)
**Grouvel, J.M.**, Production and operation of a full-scale testing loop for studying disphasic flows, 9:1862 (BA;GB)
**Grover, J.R.**, Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene, 9:2992 (J;US)
*See* White, M.G., 9:3554
**Groves, C.R.**, Population ecology of small mammals on the radioactive waste management complex, Idaho National Engineering Laboratory, 9:3296 (RA;US)
*See* Keller, B.L., 9:3314
**Gruber, W.J.**, *See* Seay, J.M., 9:2295
**Gruen, D.M.**, *See* Foosnaes, T., 9:3590
*See* Rotella, F.J., 9:2715
**Gruen, G.E.**, Severe fuel-damage scoping test performance, 9:2405 (R;US)
**Grun, J.**, *See* Herbst, M.J., 9:4191
**Grunder, H.A.**, *See* Alonso, J.R., 9:3135
**Grush, W.H.**, Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility, 9:2408 (R;US)
**Gruzensky, W.G.**, *See* Olsen, R.S., 9:3291
**Gu, Y.F.**, *See* Edwards, C., 9:3728
**Guentherodt, G.**, Electron tunneling spectroscopy of intermediate valence materials, 9:2753 (BA;NL)
**Guerin, M.R.**, *See* Buchanan, M.V., 9:1788
**Guersey, F.**, *See* Alhassid, Y., 9:3856
**Guery, M.**, *See* Beauvy, M., 9:2777
**Guetlich, P.**, *See* Bergkamp, M.A., 9:2925
**Guggenheim, H.J.**, *See* Hagen, M., 9:2860
**Guill, G.D.**, Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2537 (R;US)
**Guin, J.A.**, *See* Curtis, C.W., 9:1769, 9:1770, 9:1771
*See* Williams, D.C., 9:1762
**Gul'bekyan, G.G.**, *See* Oganesyan, Yu.Ts., 9:3126
**Gunter, M.E.**, Development of techniques for obtaining and storing premium coal samples. Annual report 1 Mar-28 Feb 83, 9:1813 (R;US)
**Guo, Y.**, *See* Baum, G., 9:3717
**Gupta, L.C.**, *See* MacLaughlin, D.E., 9:2726
**Gupta, R.P.**, *See* Fluss, M.J., 9:2772
**Gupta, S.**, *See* Breit, J.D., 9:3478
**Guralnick, S.A.**, *See* Longinow, A., 9:3064
**Gurley, L.R.**, Histone fractionation by high-performance liquid chromatography, 9:3354 (J;US)
**Gurnett, D.A.**, *See* Persoon, A.M., 9:3500
**Gusev, S.V.**, Calculation of the mechanical strength of the T-15 tokamak discharge chamber, 9:4188 (R;SU;In Russian)
**Gustafson, H.R.**, *See* Ball, R.C., 9:3733
**Gustafson, T.K.**, Coherent conversion of the sunlight spectrum. Final Report, 28 July 1980-30 April 1982, 9:2116 (R;US)
**Gustavson, D.B.**, Status of the IEEE P896 Future Backplane Bus, 9:3199 (R;US)
**Guswa, J.H.**, Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3327 (R;US)
**Gutfinger, C.**, *See* Yavuzkurt, S., 9:1910
**Guthrie, G.L.**, Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2236 (J;US)
**Gutowsky, H.S.**, *See* Keniry, M.A., 9:3353

## H

**Ha Quang, D.**, *See* Cano, R., 9:4055
**Haas, J.**, Subproject 1: deep diving diverlockout, dry transfer and rescue submersible family, 9:1850 (BA;GB)
**Haegel, N.M.**, Performance and materials aspects of Ge:Be and Ge:Ga photoconductors for far-infrared detection, 9:3211 (R;US)
*See* Haller, E.E., 9:2851
**Haekel, W.**, Investigations on heavy methal complexing by humin substances in estuaries, 9:2978 (R;DE;In German)
**Haering, J.**, *See* Werthen, J.G., 9:2849
**Hagan, J.W.**, *See* Burke, R.J., 9:4160
**Hagen, A.**, Radioactive waste disposal in the sea and alternative methods of ultimate disposal, 9:1985 (R;DE)
**Hagen, M.**, Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/$F_2$, 9:2860 (J;US)
**Hagenson, R.L.**, Compact-Toroid Fusion Reactor (CTOR) based on the field reversed theta pinch, 9:4211 (BA;XA)
Recent studies of reversed-field pinch reactors, 9:4212 (BA;XA)
**Hagopian, S.**, *See* Jenkins, C.M., 9:3727
**Hagopian, V.**, *See* Jenkins, C.M., 9:3727
**Hahn, G.T.**, *See* Cheverton, R.D., 9:2243
**Hahn, R.**, *See* Altmann, J., 9:1941
**Hahn, R.L.**, *See* Narten, A.H., 9:2940
**Haire, R.G.**, *See* Nave, S.E., 9:2787
**Hakkarainen, T.**, *See* Maekipaeae, M., 9:2658
**Halbach, K.**, *See* Orzechowski, T.J., 9:3158
**Halford, D.K.**, Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3399 (J;GB)

Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3337 (RA;US)
Iodine-129 in muscle of waterfowl using the test reactor area radioactive leaching ponds in southeastern Idaho, 9:3334 (RA;US)
Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area, 9:3300 (RA;US)
**Halle, L.F.,** Nickel ions affect a highly specific 1,4-dehydrogenation of hydrocarbons in the gas phase: metallacycles are not involved, 9:2971 (J;US)
**Hallenbeck, L.E.,** *See* Eisch, J.J., 9:2907
**Haller, E.E.,** Three holes bound to a double acceptor: $Be^+$ in germanium, 9:2851 (J;US)
**Haller, G.L.,** *See* Mantell, D.A., 9:3587
**Halverson, J.E.,** Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2891 (R;US)
**Halzen, F.,** Limits to the number of neutrinos: A comment on the $Z^0$ discovery, 9:3787 (J;US)
**Hama, S.,** *See* Clark, B.C., 9:3895
**Hama, Y.,** Large missing-mass clusters in hydrodynamical approach, 9:3628 (R;BR)
**Hamann, D.,** Location procedure for sound sources in reactor-technical enclosures, 9:2346 (R;DD)
**Hamann, D.R.,** *See* Feibelman, P.J., 9:2724
**Hamilton, M.L.,** Use of the disk bend test to assess irradiation performance of structural alloys, 9:2688 (R;US)
**Hammer, D.A.,** *See* Bluhm, H., 9:4229
**Hammond, R.B.,** *See* Galvin, G.J., 9:2874
**Hammond, W.B.,** *See* Bigeleisen, J., 9:2069
**Han, K.I.,** *See* Eisch, J.J., 9:2907
**Han, Y.,** *See* Pollard, D., 9:3444
**Hanaberger, H.,** Inspection and maintenance plans. In-service inspections, 9:2345 (R;DE)
**Hancher, C.W.,** Pilot-plant studies for solvent extraction of polychlorinated biphenyl (PCB), 9:3112 (R;US)
**Hancox, W.T.,** CANDU safety research. A status report, 9:2423 (RA;CA)
**Hankins, D.E.,** Beta-dosimetry studies at LLNL, 9:3981 (R;US)
Neutron and gamma-ray measurements on the LANL Little Boy Comet Assembly, 9:2396 (R;US)
Use of wrist albedo neutron dosimeters, 9:3201 (R;US)
**Hankins, O.E.,** *See* Rasmussen, D.A., 9:4045
**Hanley, H.J.M.,** Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3605 (J;US)
**Hannah, M.A.,** *See* Newman, L.W., 9:2223
**Hanold, R.J.,** Geothermal pumping systems, 9:2174 (R;US)
Two-phase flow studies, 9:2175 (R;US)
**Hanschel, D.B.,** Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1805 (R;US)
**Hansen, P.J.,** Weak cubic Langmuir turbulence, 9:4108 (J;US)
**Hansen, R.G.,** Preparation and certification of a uranium reference material, 9:2900 (R;ZA)
**Hansen, R.M.,** *See* MacCracken, J.G., 9:3286, 9:3319
**Hansen, S.G.,** *See* Powers, D.E., 9:3588
**Hansen, W.L.,** *See* Haller, E.E., 9:2851
**Hanson, J.D.,** Elimination of stochasticity in stellarators, 9:4157 (R;US)
**Hanson, M.,** Containment of hydraulic fractures in coal seams by in situ stresses, 9:1807 (RA;US)
**Happer, W.,** *See* Kulsrud, R.M., 9:4134
**Harar, S.,** *See* Cassagnou, Y., 9:3875
**Harari, H.,** Composite model for quarks and leptons, 9:3842 (R;IL)
**Harbottle, G.,** Neutron activation analyses: Teotihuacan trade ceramics, 9:2888 (R;US)
*See* Bishop, R.L., 9:2889, 9:4237
**Harbour, P.J.,** Models and codes for the plasma edge region, 9:4044 (R;GB)
**Harbourne, B.L.,** Application of experimental data to the estimation of fuel pin failure probability, 9:2298 (J;US)
**Hardekopf, R.A.,** *See* Jarmie, N., 9:3146
**Hardell, R.,** Peat-fired electric power plants, 9:1816 (R;SE;In Swedish)
**Harding, A.K.,** Pair production near threshold in pulsar magnetic fields, 9:3468 (R;US)
*See* Daugherty, J.K., 9:3465
**Hargreaves, R.,** Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry, 9:2247 (R;XA)
**Harley, E.L.,** Solar industrial process heat (IPH) project. Technical report, October 1981-September 1982, 9:2146 (R;US)
**Harmon, B.N.,** *See* Fu, C., 9:2721
**Harmon, S.H.,** *See* Tomkins, B.A., 9:2890
**Harms, A.A.,** Neutron cost criteria for long-term fissile fuel enhancement, 9:2273 (RA;CA)
**Harper, F.T.,** Interim results of the accident sequence evaluation program (ASEP), 9:2457 (R;US)
**Harris, F.A.,** *See* Taylor, G.N., 9:3732
**Harris, J.S.,** *See* Miller, D.L., 9:2129
**Harris, S.E.,** *See* Wang, J.C., 9:3571
**Harrison, J.F.,** Electronic structure of scandium lithide, 9:2728 (J;US)
**Harrison, J.L.,** *See* Newman, L.W., 9:2223
**Harrison, K.T.,** *See* Turner, A.D., 9:1945
**Harrison, M.F.A.,** Predicted behaviour of the single-null divertor of INTOR, 9:4148 (R;GB)
Predicted behaviour of the pumped limiter of INTOR, 9:4151 (R;GB)
**Harsh, V.,** *See* Baum, G., 9:3717
**Hart, T.T.,** *See* Milam, D., 9:2795
**Hartt, J.E.,** *See* Moodenbaugh, A.R., 9:2931
**Hartwigsen, C.C.,** *See* McKeon, D., 9:2072
**Harvey, A.,** Bianchi-symmetric metrics, 9:3851 (J;US)
**Harvey, C.A.,** Multivariable control for electric-generating plants, September 1978-February 1982, 9:2568 (R;US)
**Hasegawa, A.,** Finite-larmor-radius magnetohydrodynamic equations for microtürbulence, 9:4106 (J;US)
**Hasegawa, Akira,** Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3952 (R;JP)
*See* Takano, Hideki, 9:2329
**Hasegawa, Mitsuru,** *See* Mohri, Akihiro, 9:4074
**Haskin, F.E.,** *See* Behr, V.L., 9:2451
**Haslett, R.,** *See* Alario, J., 9:2520
**Hassan, Y.A.,** Reduction of numerical diffusion errors in thermal mixing predictions, 9:2238 (J;US)
**Hassard, J.,** *See* Alam, M.S., 9:3719
**Hassel, H.W.,** Economic projections for advanced fuel fabrication, 9:2337 (RA;US)
**Hassig, P.J.,** Firestorm formation and environment characteristics after a large-yield nuclear burst, 9:3235 (RA;US)
**Haste, G.R.,** *See* Hiroe, S., 9:4082
**Hastie, R.J.,** *See* Ashby, D.E.T.F., 9:4149
**Hastings, D.E.,** WHISTBT: a 1-1/2-D radial-transport code for bumpy tori, 9:4080 (R;US)
**Hatcher, C.R.,** Measures for increasing IAEA safeguards effectiveness, 9:2065 (J;US)
**Hatlee, M.D.,** Interplay between geometry and mobility in intramicellar kinetics, 9:2999 (J;DE)
*See* Kozak, J.J., 9:3995
**Hatton, W.G.,** Synthesis and chemistry of chiral vinyl rhenium complexes (eta-$C_5H_5$)Re(NO)($PPh_3$)(CH==CHR). Stereoselective reactions with electrophiles and a spontaneous alkylidene to olefin rearrangement, 9:2930 (J;US)
**Hausammann, R.,** *See* Allen, R.C., 9:3684
**Hausman, R.F. Jr.,** *See* Mathews, G.J., 9:3919
**Hauss, B.I.,** *See* Gordon, J.D., 9:2067
**Haustein, P.E.,** *See* Kowalski, L., 9:3903
**Haux, G.,** Subproject 2: an autonomous, manned, submersible catamaran equipment carrier - the Bruker Subcat, 9:1851 (BA;GB)
**Havenith, C.,** Methanol-dual fuel operation of diesel engines with direct injection, 9:2669 (R;DE;In German)
**Havlicek, M.,** *See* Bednar, M., 9:4038
**Hawkins, R.T.,** *See* Izatt, R.M., 9:2909
**Hawley, K.A.,** *See* Oma, K.H., 9:2002
**Hawrylak, A.M.,** *See* Ceglio, N.M., 9:4144
**Hawthorne, A.R.,** *See* Schuresko, D.D., 9:3269
**Hay, P.J.,** Ab initio studies of excited states of polyatomic molecules including spin-orbit and multiplet effects: The electronic states of $UF_6$, 9:3548 (J;US)
*See* Engelke, R., 9:2980
**Hayashi, M.,** *See* Kanda, K., 9:2355
**Hayashii, H.,** *See* Kawabata, S., 9:3198
**Hayes, W.,** *See* Dobbs, J.N., 9:2809
**Haywood, F.F.,** *See* Myrick, T.E., 9:3303
**Hayzelden, C.,** Rapid solidification microstructures in austenitic Fe-Ni alloys, 9:2733 (J;US)
**Hazeltine, R.D.,** Reduced magnetohydrodynamics and the Hasegawa—Mima equation, 9:4097 (J;US)
**Hazen, T.C.,** Effect of effluent from a nitrogen fertilizer factory and a pulp mill on the distribution and abundance of Aeromonas hydrophila in Albemarle Sound, North Carolina, 9:3387 (J;US)
*See* Esch, G.W., 9:3408
**Heard, H.C.,** Activation volume for steady state creep in polycrystalline

CsCl: cesium chloride structure, 9:2761 (BA;US)
**Heatherly, L.,** *See* Jackson, G.L., 9:4202
**Heck, F.M.,** *See* Miller, R.L., 9:4184
**Hecker, S.S.,** *See* Staudhammer, K.P., 9:2735
**Heckman, H.H.,** *See* Olson, D.L., 9:3883
**Hedley, C.J.,** *See* Lang, J.R.A., 9:1836
**Hedrick, C.L.,** Theory of transport and heating in EBT, 9:4141 (BA;XA)
**Hedstrom, G.W.,** *See* Berryman, J.G., 9:4021
**Heffner, R.H.,** Fundamental symmetries and interactions using muons, 9:3705 (RA;US)
Muon capture from the triplet hyperfine level in hydrogen, 9:3711 (RA;US)
Nuclear physics studies with muons, 9:3910 (RA;US)
Solid-state physics and chemistry, 9:3540 (RA;US)
*See* MacLaughlin, D.E., 9:2726
**Heinisch, H.L.,** Correlation of yield stress changes in 316 stainless steel irradiated with high-energy and fission neutrons, 9:2689 (R;US)
**Heinkel, J.,** *See* O'Neill, R., 9:1882
**Heinrich, H.J.,** Determination of local and time-dependent pressure curves after sudden relief of pressure on containers and container combinations, 9:2335 (B;DE;In German)
**Heinz, T.F.,** Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2908 (J;US)
**Heiser, J.H. III,** *See* Lee, B.S., 9:2255
**Heising-Goodman, C.D.,** *See* Carlson, D.D., 9:2494
**Helava, H.I.,** *See* Bailey, V.L., 9:4204
**Heller, E.J.,** *See* De Leon, N., 9:4032
*See* Reimers, J.R., 9:3553
**Heller, L.,** *See* Bohannon, G.E., 9:3785
**Heller, M.,** *See* Jend, H.H., 9:3365
**Helman, J.S.,** Absorption of spin-dependent electrons in metals, 9:2703 (RA;BR;In Spanish)
**Helmer, N.E.,** *See* Hynes, H.W. Jr., 9:2986
**Helmick, H.H.,** Gaseous fuel reactors for power systems, 9:2304 (B;US)
**Hemmings, R.L.,** *See* Todorovski, S., 9:2268
**Hemphill, R.R.,** *See* Kelley, N.D., 9:2186
**Hempstead, M.,** *See* Alam, M.S., 9:3719
**Henderson, D.,** Phase transitions in two dimensions, 9:3524 (RA;BR)
**Henderson, D.M.,** *See* Cholewa, A.F., 9:3307
**Henke, B.L.,** Pulsed plasma source spectrometry in the 80—8000-eV x-ray region, 9:4102 (J;US)
**Hennart, D.,** *See* Voorde, N. van de, 9:1955
**Hennelly, E.J.,** *See* Crandall, J., 9:1948
**Henning, W.,** *See* Frekers, D., 9:3893
**Henry, J.L.,** *See* Olsen, R.S., 9:3291
**Henry, R.N.,** *See* Olson, N.C., 9:2054
**Hepburn, J.W.,** Molecular beam study of the photochemistry of $S_1$ glyoxal, 9:3014 (J;US)
**Heras, J.M.,** Decomposition of water adsorbed in iron and nickel films, 9:2698 (RA;BR;In Spanish)
**Herbst, M.J.,** Variation of laser absorption with plasma scalelength in long-scalelength plasmas, 9:4191 (R;US)
**Herczeg, P.,** CP violation, 9:3819 (RA;US)
*See* Goldman, T., 9:3691
**Herman, H.,** *See* Baker, C., 9:4219
*See* Varljen, T.C., 9:4220
**Herman, I.P.,** *See* McWilliams, B.M., 9:3109
**Hermann, A.,** Source localization with semiconductor detector in the intracavitary therapy, 9:3379 (RA;HU;In Hungarian, English)
**Herminghaus, H.,** Beam profile monitor systems for the 180 MeV stage of MAMI, 9:3145 (TG;US)
**Herndon, P.G.,** *See* Baker, S.P., 9:2282
**Herrick, E.,** *See* Webster, R.D., 9:1818
**Hertzog, D.W.,** Precision measurement of the magnetic moment of the $\Sigma^-$ hyperon, 9:3721 (J;US)
**Herzog, T.,** Vegetation systems as components of buildings with passive energy systems, 9:2604 (RA;DE;In German)
**Hess, B.V.,** Temporary support for a UHV sample manipulator during bakeout, 9:3105 (J;US)
**Hess, D.W.,** *See* Williams, L.M., 9:2783
**Hesson, G.M.,** *See* Freshley, M.D., 9:2450
*See* Mohr, C.L., 9:2449
**Hester, R.E.,** *See* Prono, D.S., 9:3144
**Hewig, H.,** *See* Bloss, W.H., 9:2109
**Heybrock, G.,** *See* Altmann, J., 9:1941
**Hibou, F.,** *See* Aslanides, E., 9:3171
**Hick, H.,** Investigations on the monitoring of structural integrity and fault location for civil engineering prestressed concrete structures by acoustic emission analysis, 9:3100 (R;AT;In German)
**Hickey, B.,** Note on current position regarding the development by the UKAEA of reduced enrichment fuels for research and test reactors, 9:2365 (RA;US)
**Hickman, J.W.,** Development and organization of the industry/NRC procedures guide, 9:2493 (BA;US)
**Hickman, R.B.,** *See* Garelis, E., 9:3089
**Hickman, R.G.,** Proceedings: 17th Asilomar conference on fire and blast effects of nuclear weapons, 9:3232 (R;US)
**Hickman, W.W.,** *See* Chappell, J.R., 9:2192
**Higaki, S.,** *See* Nakai, S., 9:4183
**Higashi, A.,** *See* Suzuki, N., 9:2477
**Higbie, P.R.,** *See* Nagai, T., 9:3505
**High, H.M.,** Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2443 (R;US)
**Highland, V.L.,** Experiment to measure the kaon beta decay rate, 9:3692 (RA;US)
**Hilborn, J.W.,** Small reactors for low-temperature heating, 9:2387 (RA;CA)
**Hildenbrand, D.L.,** *See* Brittain, R.D., 9:2933
**Hildum, J.S.,** *See* Linford, G.J., 9:4232
**Hill, A.H.,** Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1779 (R;US)
**Hill, C.T.,** *See* Dawson, S., 9:3854
**Hill, D.,** Identification of cost factors for the ocean disposal alternative for low-level radioactive waste, 9:2001 (R;US)
**Hill, D.W.,** *See* Gandhi, O.P., 9:3429
**Hill, J.C.,** *See* Smith, A.R., 9:3885
*See* Wohn, F.K., 9:3918
**Hill, J.J.,** *See* Janssen, J.E., 9:2636
**Hilliard, J.E.,** *See* Qian, Y.J., 9:2746
**Hillis, D.L.,** *See* Hiroe, S., 9:4082
**Hills, J.G.,** Formation of comets by radiation pressure in the outer protosun. II. Dependence on the radiation-grain coupling, 9:3475 (J;US)
Formation of comets by radiation pressure in the outer protosun. III. Dependence on the anisotropy of the radiation field, 9:3476 (J;US)
**Hilscher, D.,** *See* Breuer, H., 9:3897
**Himanen, V.,** Traffic impacts and energy consumption in urban areas, 9:2641 (R;FI;In Finnish)
**Hinckley, J.P.,** *See* Mayberry, J.L., 9:2038
**Hinga, K.R.,** High-level radioactive waste disposal in the ocean floor: an introduction, 9:2042 (J;US)
**Hinn, G.M.,** Some methods and problems associated with making thick (1 mg/cm$^2$) $^{28}$ $^{29}$ $^{30}$silicon targets, 9:3148 (R;US)
**Hintz, N.M.,** Tests of the $K^+$-nucleon interaction in nuclei: an inelastic-scattering survey, 9:3879 (RA;US)
**Hiorns, D.S.,** Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2248 (R;XA)
**Hipolito, O.,** *See* Bodas, E.L. de, 9:3533
**Hirakawa, K.,** *See* Yoshizawa, H., 9:2847
**Hiramoto, K.,** *See* Aoyama, M., 9:2214
**Hirano, Keiichi,** *See* Okamoto, Masao, 9:4069
**Hirano, Kemmei,** *See* Adachi, Hiromichi, 9:2438
**Hirayama, K.,** *See* Yoshida, Y., 9:2385
**Hirling, J.,** Comparison of some particulate air filter testing methods used in normal and unfavourable conditions, 9:3121 (RA;XA)
**Hiroe, S.,** Observation of hot-electron ring instabilities in ELMO Bumpy Torus, 9:4082 (R;US)
**Hirsch, H.,** *See* Altmann, J., 9:1941
**Hirst, E.,** Comparison of actual electricity savings with audit predictions in the BPA residential weatherization pilot program, 9:2628 (R;US)
Measuring effects of utility conservation programs: inputs to utility decision making, 9:2594 (R;US)
**Hirvonen, J.,** *See* Tuominen, J., 9:2225
**Hiskes, J.R.,** Generation of vibrationally excited $H_3$ molecules by $H_3^+$ wall collisions, 9:3546 (R;US)
*See* Wimmer, E., 9:2723
**Hiszek, V.,** *See* Varga, G., 9:3367
**Hitchon, W.N.G.,** *See* Ashby, D.E.T.F., 9:4149
**Ho, D.,** *See* Anania, G., 9:4140
**Ho, K.,** *See* Fu, C., 9:2721
**Ho, T.,** Nonadiabatic approach for resonant molecular multiphoton absorption processes in intense infrared laser fields, 9:3551 (J;US)
**Hobson, D.O.,** Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding, 9:2751 (J;US)
**Hobson, W.S.,** Photoluminescent properties of n-GaAs electrodes: applications of the dead-layer model to photoelectrochemical cells. Technical report, 9:2105 (R;US)
**Hockham, R.J.,** *See* Hucknall, D.J., 9:1905

**Hodges, C.L.,** *See* Joyce, D.C., 9:3730
**Hodges, D.T.,** *See* Danielwicz, E.J., 9:4047
**Hodgett, D.,** *See* Ball, D.A., 9:2629
**Hoecker, K.H.,** Analysis of the energy-political paths of the Enquete Commission, 9:2540 (R;DE;In German)
**Hoehlein, G.,** Waste management at the Karlsruhe Nuclear Research Center, 9:1987 (R;DE)
**Hoehler, G.,** Pion-nucleon physics at LAMPF II, 9:3674 (RA;US)
**Hoehne, J.L.,** Cummins advanced turbocompound diesel engine evaluation, 9:2668 (R;US)
**Hoerjel, N.,** Emergency plans for nuclear power accidents. Danish-Swedish exercise Oct 7th 1982, 9:2437 (R;SE;In Swedish)
**Hofe, L. van,** Theoretical aspects of nucleus-nucleus collisions, 9:3944 (RA;XC)
**Hoffert, M.I.,** Evaporation-limited tropical temperatures as a constraint on climate sensitivity, 9:3261 (J;US)
**Hoffman, A.L.,** Particle lifetime scaling in field-reversed configurations based on lower-hybrid-drift resistivity, 9:4086 (J;US)
**Hoffman, C.M.,** Experiment to measure $eta_{000}$, 9:3688 (RA;US)
Possibility of observing nu p elastic scattering in a hydrogen bubble chamber at LAMPF II, 9:3682 (RA;US)
*See* Chaloupka, V., 9:3695
*See* Goldman, T., 9:3679
*See* Herczeg, P., 9:3819
**Hoffman, D.K.,** *See* Evans, J.W., 9:2815
**Hoffman, F.O.,** *See* Miller, C.W., 9:3305
**Hoffman, M.R.,** Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers, 9:2996 (J;US)
**Hoffman, M.Z.,** Formation of photoactive charge-transfer complexes between methylviologen and sacrificial electron donors. EDTA and triethanolamine, 9:3010 (J;US)
**Hoffmann, G.W.,** Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3892 (RA;US)
*See* Clark, B.C., 9:3895
**Hofmann, H.J.,** Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1849 (BA;GB)
**Hofmann, W.,** *See* Koban, J., 9:2328
**Hogan, C.J.,** *See* Fry, J.N., 9:3492
**Hogan, J.T.,** *See* Schuresko, D.D., 9:4152
**Hogan, W.J.,** *See* Koopman, R.P., 9:1885
**Hogel, J.,** *See* Gehre, G., 9:2213
**Hogenkamp, D.J.,** *See* Farneth, W.D., 9:3026
**Hohle, E.,** Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway), 9:2094 (R;NO;In Norwegian)
**Holder, J.D.,** Preparation of high-temperature oxide-metal eutectic composites: a review, 9:2811 (J;US)
**Holdren, M.W.,** *See* Berry, D.A., 9:1859
**Holland, O.W.,** *See* Narayan, J., 9:2840
**Holland, R.F.,** Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$, 9:3591 (J;US)
*See* Maier, W.B. II, 9:3552
**Holloway, R.W.,** *See* Whitham, K., 9:4195
**Holly, D.J.,** Plasma heating with strong poloidal Ohmic currents, 9:4090 (J;US)
**Holm, L.,** *See* Poulsen, K.D., 9:2162
**Holm, T.,** Final report on fluidized bed materials. Stage 4, 9:3117 (R;SE;In Swedish)
**Holman, P.L.,** *See* Newman, L.W., 9:2223
**Holmes, N.C.,** Raman spectroscopy of shocked water, 9:3545 (R;US)
**Holroyd, R.A.,** *See* Nishikawa, M., 9:2982
**Holroyd, R.J.,** Liquid lithium as a coolant for Tokamak fusion reactors, 9:4150 (R;GB)
**Holstad, A.,** Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2078 (R;NO;In Norwegian)
**Holt, J.B.,** Beryllium-containing high specific strength amorphous alloys, 9:2771 (J;US)
Stabilization of $\beta$-Be at room temperature by a rapid quench technique, 9:2766 (J;US)
**Holt, R.A.,** *See* Causey, A.R., 9:2278
**Holt, S.S.,** *See* Priedhorsky, W.C., 9:3488
**Holtermann, D.L.,** Radiative and nonradiative relaxation dynamics of sulfur dioxide excited in the 3000 to 3300-A region. Fluorescence emission spectra and lifetimes of single rotational levels, 9:3012 (J;US)
**Holtz, J.Z.,** *See* Davis, J.I., 9:2070
**Holtzberg, F.,** *See* Guentherodt, G., 9:2753
*See* Mook, H.A., 9:2877
**Homan, F.J.,** *See* Kania, M.J., 9:2253
**Hones, E.W. Jr.,** New observations of plasma vortices and insights into their interpretation, 9:3509 (J;US)
*See* Baker, D.N., 9:3508
*See* Bame, S.J., 9:3506
*See* Mozer, F.S., 9:3510
**Hong, J.H.,** Vapor liquid equilibrium study of the $H_2CH_4$ system at low temperatures and elevated pressures. Research report (annual) Jan-Dec 79, 9:2083 (R;US)
**Hooper, E.B.,** *See* Turner, W.C., 9:4198
**Hoovler, G.S.,** *See* Newman, L.W., 9:2223
**Hopf, M.T.,** *See* Molz, F.J., 9:2522
**Hopkins, D.,** *See* Collin, W., 9:1929
**Hopkins, D.B .,** *See* Orzechowski, T.J., 9:3158
**Hopkins, G.R.,** Low activation fusion reactor design, 9:4217 (BA;XA)
**Hopkins, J.B.,** *See* Morse, M.D., 9:3547
**Hopp, G.,** *See* D'Agostini, G., 9:3625
**Horen, D.J.,** *See* Tinsley, J.R., 9:3933
**Horn, D.,** *See* Dybdal, K., 9:3932
**Horne, K.,** *See* Jensen, K.A., 9:3487
**Horning, R.R.,** Multidomain, multirecord-type Datatrieve-11 databases, 9:4261 (R;US)
Processing time using Datatrieve-11, clunks, and FORTRAN, 9:4260 (R;US)
**Horowitz, B.,** Solitons in the Peierls condensate. I phase solitons, 9:3845 (R;IL)
**Horton, A.I.,** Simulation of Devonian shale infill drilling, 9:1894 (RA;US)
*See* Mercer, J.C., 9:1888
**Horton, W.,** *See* Varnado, G.B., 9:2499
**Horvath, L.,** *See* Varga, G., 9:3367
**Horwitz, N.,** *See* Chen, A., 9:3736
**Hoshi, Tatsuo,** Semiannual progress report on the NSRR experiments, (12). January, 1981 to June, 1981, 9:2389 (R;JP;In Japanese)
**Hotston, E.S.,** *See* Harrison, M.F.A., 9:4148, 9:4151
**Houk, R.S.,** Mass spectra and ionization temperatures in an argon-nitrogen inductively coupled plasma, 9:3609 (J;US)
**Houlberg, W.A.,** *See* Hastings, D.E., 9:4080
**Houlrik, J.M.,** Floating phase in the chiral Potts model. A Monte Carlo renormalization-group analysis, 9:3992 (J;US)
**Houriet, R.,** *See* Halle, L.F., 9:2971
**Houston, J.E.,** *See* Rye, R.R., 9:3574
**Howard, A.J.,** *See* Champagne, A.E., 9:3490
**Howard, D.,** Vane coupling rings: a simple technique for stabilizing a four-vane radiofrequency quadrupole structure, 9:3131 (J;US)
**Howard, J.,** Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of $\gamma$(OHO) vs R (OO), 9:3975 (J;US)
**Howell, R.H.,** Low energy positron production at the Livermore linac, 9:3132 (J;US)
**Howieson, J.,** Protecting future generations, 9:1974 (RA;CA)
**Howorka, F.,** Progress report 1982 of the Institute of Experimental Physics of the Leopold Franzens University Innsbruck, 9:3535 (R;AT;In German)
*See* Rozsa, K., 9:3087
**Hrovat, M.F.,** Status of fuel element technology for plate type dispersion fuels with high uranium density, 9:2361 (RA;US)
**Hsieh, C.T.,** *See* Hoffert, M.I., 9:3261
**Hsieh, T.C.,** Low-temperature thermal conductivity of porous Vycor, 9:2881 (J;NL)
Study of $UO_2$ wafer fuel for very high-power research reactors, 9:2370 (RA;US)
**Hsu, C.T.,** Performance of tornado-type wind turbines with radial inflow supply, 9:2188 (R;US)
**Hsu, F.,** *See* Solomon, A.A., 9:2734
**Hsu, J.Y.,** Linear and quasilinear theory of second electron cyclotron harmonic heating of tokamak plasmas, 9:4088 (J;US)
**Hsu, P.Y.,** *See* Deis, G.A., 9:4158
**Hsu, S.L.,** *See* Babu, G.N., 9:3030
**Huang, F.H.,** *See* Hamilton, M.L., 9:2688
**Huang, H.W.,** 100-microsecond-resolved EXAFS technique for studying protein dynamics, 9:3218 (J;US)
**Huang, K.,** Theoretical triply differential cross section of electron-impact ionization of atoms, 9:3570 (J;US)
**Huang, S.N.,** Seismic analysis of a nonlinear airlock system, 9:2414 (R;US)
**Huang, S.Z.,** Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/, 9:2764 (J;GB)
**Huang, X.,** Resonance fluorescence of a two-level atom near a metal surface. Technical report, 9:3511 (R;US)
**Hucknall, D.J.,** Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy, 9:1905 (BA;GB)

**Huddleston, R.K.**, Rapid long range intramolecular electron transfer within a steroid molecule with two electron binding groups, 9:3034 (J;US)
**Huebener, R.P.**, *See* Eichele, R., 9:3074
**Huettmeier, U.J.**, *See* Liu, L.C., 9:3657
**Huettner, J.**, Upper and lower half-body irradiation of patients with inoperable particellular bronchial carcinoma, 9:3377 (RA;HU;In Hungarian, German)
**Huff, G.A. Jr.**, *See* Satterfield, C.N., 9:2994
**Hug, G.L.**, *See* Chattopadhyay, S.K., 9:3008
**Hughes, M.H.**, *See* Ashby, D.E.T.F., 9:4149
**Hughes, P.**, *See* Martin, S., 9:3247
**Hughes, V.W.**, Muon g/sub μ/-2 experiment, 9:3709 (RA;US)
*See* Baum, G., 9:3717
*See* Howell, R.H., 9:3132
**Hui, Y.**, Host-guest interactions in amylose inclusion complexes: photochemistry of surfactant stilbenes in helical cavities of amylose, 9:2997 (J;US)
**Huisken, F.**, Competing dissociation channels in the infrared multiphoton decomposition of ethyl vinyl ether, 9:3022 (J;US)
**Huizenga, J.R.**, *See* Breuer, H., 9:3897
**Hungerford, E.V.**, Possible investigations of the ($K^-$, $K^+$) reaction, 9:3648 (RA;US)
Spectroscopy of strange dibaryons with $K^- d \rightarrow \Lambda p \pi^-$ reaction, 9:3666 (RA;US)
Studies of narrow Σ-hypernuclear structure, 9:3649 (RA;US)
**Hunsaker, C.T.**, Characterization of water quality for regional planning, 9:3331 (R;US)
**Hunt, A.L.**, *See* Turner, W.C., 9:4198
**Hunt, J.T.**, *See* Linford, G.J., 9:4232
**Hunt, L.P.**, *See* Khattak, C.P., 9:2122
**Hunter, C.W.**, *See* Bard, F.E., 9:2289
**Hunter, O. Jr.**, *See* O'Brien, M.H., 9:3219
**Huray, P.G.**, *See* Nave, S.E., 9:2787
**Hurley, F.I.**, *See* Spitalnik, J., 9:2484
**Hurst, J.J.**, *See* Moodenbaugh, A.R., 9:2931
**Husbands, T.B.**, *See* Buck, A.D., 9:1796
**Huschka, H.**, *See* Hrovat, M.F., 9:2361
**Hush, D.**, *See* Ahmed, N., 9:3106
**Hussein, M.S.**, Optical theorem and forward glory effects in heavy-ion scattering, 9:3948 (R;BR)
*See* Carlson, B.V., 9:3946
**Hustrulid, W.A.**, *See* Montazer, P.M., 9:3441
**Huszar, L.**, *See* Woolson, W.A., 9:3278
**Hutchinson, I.H.**, *See* Malacarne, M., 9:4041
**Hwang, D.**, High-power ICRF and ICRF plus neutral-beam heating on PLT, 9:4131 (BA;XA)
**Hwang, M.**, Effects of alloy composition and processing on the microstructure of D-9 type stainless steel. Final report, 9:2684 (R;US)
**Hwu, S.J.**, *See* Ford, J.E., 9:2927
**Hyatt, J.P.**, *See* Davison, P., 9:1847
**Hyde, D.W.**, *See* Kiger, S.A., 9:3062
**Hyde, R.A.**, *See* McWilliams, B.M., 9:3109
**Hyer, F.K.**, *See* Venhuizen, J.R., 9:2465
**Hynes, H.W. Jr.**, Hydrocracking polycyclic hydrocarbons over a dual-functional zeolite (faujasite)-based catalyst, 9:2986 (J;US)
**Hynes, M.V.**, Electromagnetic decays of hyperon-excited states, 9:3775 (RA;US)
Radiative kaon capture, 9:3641 (RA;US)
ΞN scattering as a probe of the strong interaction, 9:3667 (RA;US)
*See* Goldman, T., 9:3697
**Hysing, T.**, Simplified optimization and sensitivity analysis of focusing wave power plants, 9:2183 (R;NO;In Norwegian)

## I

**Iachello, F.**, *See* Alhassid, Y., 9:3856
**Ichiba, Hideo**, Heat flux in the presence of shifting cold and hot electron Maxwellian distributions, 9:4067 (R;JP)
**Ide, H.**, *See* Hsu, C.T., 9:2188
**Idzorek, G.C.**, Fabrication of a hermetically sealed connector, 9:3104 (R;US)
**Igata, N.**, *See* Iso, Y., 9:4205
**Igo, G.**, Spin-rotation parameter in $K^+$-p elastic scattering near 1.5 GeV/c, 9:3675 (RA;US)
**Ihara, H.**, *See* Tasaka, K., 9:3915
**Ikezawa, Y.**, *See* Yoshida, Y., 9:2385
**Ikushima, Takeshi**, SONATINA-2V: a computer program for seismic analysis of the two-dimensional vertical slice HTGR core, 9:2250 (R;JP)
**Il'inov, A.S.**, Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3937 (R;SU;In Russian)
**Ilenburg, R.**, *See* Baranov, V.A., 9:3187
**Ilgenfritz, E.M.**, Questions of phase transition and coupling constant renormalization in the interacting instanton gas, 9:4013 (RA;SU)
**Imasaki, K.**, *See* Nakai, S., 9:4183
**Imry, Y.**, *See* Ovadyahu, Z., 9:2796
**In, S.Y.**, *See* Chung, M.K., 9:4182
**Inada, Yoshifumi**, *See* Yamada, Kawakatsu, 9:4061
**Ingram, M.D.**, Ionic conductivity and the weak electrolyte theory of glass, 9:2885 (J;NL)
**Inouye, H.**, *See* Liu, C.T., 9:2758
**Inutake, M.**, *See* Amagishi, Y., 9:4065
**Isaacs, T.J.**, *See* Fritz, I.J., 9:2879
**Ishibashi, K.**, Winding design study of superconducting 10 T dipoles for a synchrotron, 9:3078 (J;US)
**Ishida, T.**, Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2977 (R;US)
**Ishii, Toshio**, *See* Hoshi, Tatsuo, 9:2389
**Ishikawa, Makoto**, Power coefficient anomaly in Joyo, (2). Presumption about the causing mechanism, 9:2395 (R;JP;In Japanese)
**Ishikawa, Yoshiaki**, *See* Mishima, Kaichiro, 9:2391
**Iskander, S.K.**, *See* Cheverton, R.D., 9:2243
**Iso, Y.**, Fusion reactor design-III. Report on the third IAEA technical committee meeting and workshop, Tokyo, Japan, 5-16 October 1981, 9:4205 (BA;XA)
**Isoya, J.**, *See* Tang, J., 9:2818
**Ivanov, G.A.**, *See* Viktorov, Yu.B., 9:3140
**Ivanov, I.N.**, *See* Viktorov, Yu.B., 9:3140, 9:3141
**Ivanov, M.A.**, *See* Efimov, G.V., 9:3815
**Iversen, S.**, *See* Saha, A., 9:3734
**Iwai, Tsuruji**, *See* Matsumoto, Atsushi, 9:4073
**Iwamura, Takamichi**, *See* Adachi, Hiromichi, 9:2438
**Iwata, H.**, Coal-fired MHD combustor development project: Phase IIIA. Final technical report, 9:2588 (R;US)
**Iwata, S.**, *See* Kawabata, S., 9:3198
**Iwata, Tadao**, Defect production rates in ion-irradiated metals, 9:4180 (RA;JP;In Japanese)
**Iyengar, P.K.**, Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2400 (J;US)
**Izatt, R.M.**, Cation fluxes from binary $Ag^+$-M/sup n+/ mixtures in a $H_2O$-$CHCl_3$-$H_2O$ liquid membrane system containing a series of macrocyclic ligand carriers, 9:2910 (J;US)
Selective $M^+$-$H^+$ coupled transport of cations through a liquid membrane by macrocyclic calixarene ligands, 9:2909 (J;US)
**Izatt, S.R.**, *See* Izatt, R.M., 9:2909
**Izquierdo, J.**, *See* Cereceda, M., 9:2479
**Izzo, R.**, Reduced equations for internal kinks in tokamaks, 9:4120 (J;US)

## J

**Jaarsma, R.J.**, *See* Colombo, A.G., 9:4246
**Jackson, A.D.**, Baryons as chiral solitons, 9:3822 (J;US)
**Jackson, G.L.**, Initial wall conditioning in Doublet III, 9:4202 (J;US)
**Jackson, H.E.**, *See* Dutta, S., 9:2872
**Jackson, J.**, *See* Allinger, J., 9:3076
**Jackson, P.O.**, *See* Fisher, D.R., 9:3397
**Jacobs, E.L.**, *See* Berg, R.S., 9:3130
**Jacobs, J.J.**, Determination, by x-ray-fluorescence spectrometry, of gold and uranium on resin, 9:2898 (R;ZA)
*See* Balaes, A.M.E., 9:2897, 9:3214
**Jacobs, L.**, *See* Creutz, M., 9:3855
**Jacquet-Francillon, N.**, Fabrication of high activity glasses in the cells VULCAIN and PIVER. Leaching at three temperatures of some of these glasses in the VULCAIN cell, 9:1952 (R;XE;In French)
**Jacquot, C.**, *See* Delaunay, M., 9:4231
**Jaeger, E.F.**, *See* Downum, W.B., 9:4081
**Jaeger, R.**, *See* Rosenberg, R.A., 9:2853
*See* Stoehr, J., 9:2863
**Jaffe, J.E.**, *See* Zunger, A., 9:2865
**Jamali, K.**, Probabilistic methods for accident progression analysis, 9:2504 (BA;US)
**James, L.A.**, *See* Ermi, A.M., 9:2690
*See* Mills, W.J., 9:2691
**James, M.R.**, *See* Stewart, M.K., 9:2894
**James, R.**, Direct free-hole absorption induced in germanium by 1.06 μm picosecond pulses, 9:2953 (J;US)

**James, R.A.**, Operational and economic aspects of CANDU fuel cycles, 9:2276 (J;US)
**James, S.D.**, *See* Smith, P.H., 9:2523
**Jamison, K.D.**, *See* McConnell, R.P., 9:2719
**Jamjoom, M.M.O.**, *See* Schneeberger, J.P., 9:2483
**Jankus, V.Z.**, *See* Hsieh, T.C., 9:2370
**Janossy, M.**, *See* Rozsa, K., 9:3087
**Jansen, B.**, Radiation induced modification of polyurethane for biomedical applications, 9:3032 (R;DE;In German)
**Jansky, J.H.**, Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations, 9:1811 (R;US)
**Janssen, J.E.**, Ventilation for control of indoor air quality: a case study, 9:2636 (J;GB)
**Janssens, J.H.**, Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2134 (J;US)
**Janulis, J.**, *See* Biljetina, R., 9:2080
**Jaric, M.V.**, *See* Mukamel, D., 9:4022
**Jarmie, N.**, Experience with a double-compensating beam calorimeter, 9:3146 (J;US)
**Jaros, J.A.**, Precise measurement of the tau lifetime, 9:3724 (J;US)
*See* Lockyer, N.S., 9:3716
**Jaroszewicz, T.**, *See* Alberi, G., 9:3746
**Jarrold, M.F.**, Unimolecular and bimolecular reactions in the $C_4H_6$/sup +center-dot/ system: Experiment and theory, 9:3583 (J;US)
**Jarvinen, G.D.**, *See* Kubas, G.J., 9:2945
**Jasinski, J.M.**, High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3011 (J;US)
**Jassby, D.L.**, *See* Kulsrud, R.M., 9:4134
**Jatavallabhula, K.**, *See* Gerberich, W.W., 9:2736
**Jawahery, A.**, *See* Chen, A., 9:3736
**Jefferson, R.M.**, Regulation versus reality, 9:1944 (R;US)
**Jeffries, B.T.**, *See* Summers, G.P., 9:2793
**Jellison, G.E. Jr.**, Importance of temperature-dependent optical properties for Raman-temperature measurements for silicon, 9:2855 (J;US)
**Jend, H.H.**, Application of contrast media in computer tomography, 9:3365 (RA;HU;In Hungarian, German)
**Jenkins, C.M.**, Existence of Ξ resonances above 2 GeV, 9:3727 (J;US)
**Jenkins, D.**, Burnup improvement through reshuffling of fuel bundles of the first fuel change in CANDU-600, 9:2269 (RA;CA)
**Jennison, D.R.**, Strain-induced localization and electronically stimulated desorption and dissociation, 9:2846 (J;US)
**Jennrich, E.**, *See* Schafer, J., 9:1950
**Jensen, A.**, Reduced enrichment activities in Denmark, 9:2364 (RA;US)
**Jensen, B.**, Dispersion of the refractive index of InP and ZnTe, 9:2870 (J;US)
Linear and nonlinear intensity dependent refractive index of Hg/sub 1-x/Cd/sub x/Te, 9:2848 (J;US)
**Jensen, K.A.**, Correlated x-ray and optical time variability of TT arietis, 9:3487 (J;US)
**Jensen, S.J.K.**, *See* Houlrik, J.M., 9:3992
**Jenson, E.D.**, Determination of xenon in irradiated nuclear fuel using a shielded electron microprobe, 9:1933 (R;US)
**Jeppson, D.W.**, *See* Muhlestein, L.D., 9:4166
**Jeppson, M.R.**, Microwave methods and apparatus for paving and paving maintenance. Final report on Phase I, 9:2643 (R;US)
**Jernigan, T.E.**, *See* Liang, E.P., 9:3483
**Jianzu, Z.**, *See* Xinzhou, L., 9:3831
**Jirousek, V.**, *See* Gehre, G., 9:2213
**Jodidio, A.**, *See* Carr, J., 9:3735
**Johannesen, A.**, New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2576 (R;NO;In Norwegian)
**Johnson, B.C.**, *See* Linford, G.J., 9:4232
**Johnson, C.**, *See* Baker, C., 9:4219
**Johnson, C.D.**, Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1776 (R;US)
**Johnson, D.W.**, High-speed, low-altitude payload delivery using a single large ribbon parachute, 9:3072 (R;US)
**Johnson, F.S.**, Evaluation of gas producing potential from unmineable coal seams, 9:1883 (RA;US)
**Johnson, J.L.**, Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78, 9:1780 (R;US)
*See* Anania, G., 9:4112
**Johnson, L.L.**, *See* Besen, S.M., 9:2563
**Johnson, P.C.**, Optically-pumped mercury vapour cell in coaxial geometry. No. 1. Transport of resonance radiation, 9:2918 (R;US)
Optically-pumped mercury vapour cell in coaxial geometry. 2. Optical pumping by lines in the visible triplet, 9:2919 (R;US)
**Johnson, R.D.**, Relationships of black-tailed jack rabbit diets to vegetal composition of habitats, 9:3318 (RA;US)
*See* Anderson, J.E., 9:3321
**Johnson, R.G.**, *See* Behrens, J.W., 9:2039
**Johnson, R.T.**, *See* Joyce, D.C., 9:3730
**Johnson, W.R.**, Materials selection for advanced-HTGR component development, 9:2256 (J;US)
**Johnston, H.S.**, *See* Podolske, J.R., 9:3558
**Jonas, J.J.**, *See* Sakai, T., 9:2730
**Jones, A.G.**, *See* Abrams, M.J., 9:3045
**Jones, C.W.**, *See* Lloyd, R.D., 9:3404
**Jones, E.**, Offshore LNG transfer system, 9:1902 (BA;GB)
**Jones, E.D.**, Fusion welding process, 9:2727 (P;US)
**Jones, G. II**, Photoisomerization of charge-transfer complexes of hexamethyl(Dewar benzene). Contrasting paths for rearrangement involving adiabatic reaction and ionic photodissocation, 9:3025 (J;US)
Variations in mechanism for photoinduced valence isomerizaation of an electron-donor nonconjugated diene, 9:3024 (J;US)
*See* Hoffman, M.Z., 9:3010
**Jones, L.W.**, *See* Ball, R.C., 9:3733
**Jones, M.d**, *See* Taylor, G.N., 9:3732
**Jones, M.E.**, Space-time evolution of the beam-plasma instability, 9:4109 (J;US)
**Jones, R.**, Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3422 (J;NL)
**Jones, R.D.**, Magnetic surface waves in plasmas, 9:4098 (J;US)
**Jones, W.M.**, Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides, 9:2115 (R;US)
**Jong, B.W.**, Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1802 (R;US)
**Jordan, J.**, Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1791 (R;US)
**Jorgensen, J.D.**, *See* Rotella, F.J., 9:2715
**Joy, R.W.**, Rapidly refuelable fuel cell, 9:2530 (P;US)
**Joyce, D.C.**, Search for fractional charges in water, 9:3730 (J;US)
**Junk, G.A.**, *See* Capellen, J.M., 9:2096

## K

**Kabat, M.J.**, Canadian nuclear air cleaning standards and their application in Ontario Hydro, 9:2349 (RA;XA)
**Kabir, M.I.**, *See* Schechter, R.S., 9:1918
**Kablitzer, S.**, *See* Spear, W.E., 9:2110
**Kaempfer, B.**, Phase transitions in nuclear matter and consequences for neutron stars, 9:3955 (R;DD)
**Kaerkkaeinen, S.**, Heat storage in district heating systems, 9:2664 (R;FI;In Finnish)
**Kagayama, T.**, *See* Suzuki, N., 9:2477
**Kahana, S.H.**, *See* Auerbach, E.H., 9:3793
**Kahn, S.A.**, *See* Baker, N.J., 9:3731
**Kaindl, G.**, Surface effects on energies of Auger electrons from Xe(111), 9:2857 (J;US)
**Kaiser, T.B.**, Ballooning modes in quadrupole tandem mirrors, 9:4111 (J;US)
**Kako, E.**, *See* Ohkubo, K., 9:4064
**Kalema, T.**, Performance of three solar houses, 9:2147 (R;FI;In Finnish)
**Kaletka, M.**, *See* Saha, A., 9:3734
**Kallberg, H.**, Energy efficiency of different modes of goods transport, 9:2639 (R;FI;In Finnish)
Energy efficiency of different modes of person transport, 9:2640 (R;FI;In Finnish)
**Kallonen, I.**, Treatment of radioactive liquid wastes at the Loviisa nuclear power station, Finland, 9:2012 (J;US)
**Kalogeropoulos, T.**, Measurement of CP violation in Λ decay, 9:3689 (RA;US)
**Kalos, M.H.**, *See* Whitlock, P.A., 9:4031
**Kamaka, P.**, *See* Siegel, S.M., 9:3423
**Kaminskaya, A.M.**, *See* Viktorov, Yu.B., 9:3140, 9:3141
**Kaminskij, A.K.**, *See* Viktorov, Yu.B., 9:3140, 9:3141

**Kamitakahara, W.A.,** Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite, 9:2785 (J;US)
**Kamizono, Hiroshi,** *See* Banba, Tsunetaka, 9:1992
**Kammash, T.,** *See* Nguyen, K., 9:4114
**Kammermeier, H.,** Imperfections and phase transformations by mono-N-alkylammonium-uranium glimmers, 9:3041 (R;DE;In German)
**Kampas, F.J.,** *See* Rajeswaran, G., 9:2837
**Kamppinen, L.M.,** *See* Koopman, R.P., 9:1885
**Kanda, K.,** KUCA critical experiment program using HEU and MEU fuel, 9:2376 (RA;US)
Licensing procedures and safety criteria for core conversion in Japan, 9:2355 (RA;US)
**Kane, J.R.,** *See* Hertzog, D.W., 9:3721
**Kaneko, Kunio,** *See* Takano, Hideki, 9:2329
**Kaneko, O.,** *See* Noda, N., 9:4070
**Kaneyoshi, T.,** *See* Sarmento, E.F., 9:3523
**Kang, H.D.,** *See* Chung, M.K., 9:4182
**Kang, S.W.,** Moving boundaries: a numerical model, 9:3243 (RA;US)
**Kania, M.J.,** Irradiation performance of LEU fuel particle designs, 9:2253 (J;US)
**Kanka, J.,** *See* Kepak, F., 9:1957
**Kanki, T.,** *See* Kobayashi, R., 9:2024
**Kanter, E.P.,** Dependence of multiple-scattering distributions on the charge states of fast ions exiting from solid targets, 9:3567 (J;US)
**Kantrowitz, F.,** Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4046 (R;US)
**Kanury, A.M.,** Blast/fire interaction scaling, 9:3246 (RA;US)
Spontaneous ignition of solids subjected to linearly time-dependent radiant exposure, 9:3054 (RA;US)
**Kao, Y.H.,** *See* Goldman, A.I., 9:2844
**Kapila, A.K.,** Reactive-diffuse systems with Arrhenius kinetics: multiple solutions, ignition and extinction, 9:2976 (J;US)
**Kaplan, I.R.,** *See* Rau, G.H., 9:3328
**Kaplan, M.,** *See* Mullins, O.C., 9:2981
**Kappes, M.M.,** *See* Halle, L.F., 9:2971
**Kapulla, H.,** *See* Frotscher, H., 9:1956
**Karadayi, H.R.,** SO(14) unification of 3+1 families, 9:3803 (R;XA)
**Karas, J.,** *See* Pugmire, R.J., 9:1787
**Karbowski, J.S.,** *See* Miller, R.L., 9:4184
*See* Varljen, T.C., 9:4209
**Kardashev, N.S.,** Gamma-gun in the center of the galaxy, 9:3472 (R;SU)
**Karkheck, J.,** Proceedings of the forum on district heating for Long Island, 9:2660 (R;US)
**Karo, A.M.,** *See* Hiskes, J.R., 9:3546
*See* Wimmer, E., 9:2723
**Karol, P.J.,** Estimation of neutron-induced spallation yields of krypton isotopes, 9:3902 (J;US)
**Karpeshin, F.F.,** Nonradiative excitation of the muonic atom $^{238}U$ as an inverse conversion process, 9:3936 (R;SU)
**Kartes, H.,** Solidification of alpha-bearing wastes in ceramic, 9:1954 (R;XE;In German)
**Kasha, H.,** *See* Black, J.K., 9:3168
*See* Larsen, R.C., 9:3616
**Kasper, G.,** *See* Thomson, S.J., 9:1806
**Kast, S.J.,** Local heat transfer where heated rods touch in axially flowing water, 9:2442 (R;US)
*See* Misiewicz, R., 9:2287
**Kasuya, T.,** *See* Burlet, P., 9:2779
**Kataev, A.L.,** Application of Gegenbauer polynomial technique to 5-loop calculations in gphi$^4$ theory, 9:4014 (RA;SU;In Russian)
New approach to the calculation of multiloop Feynman diagrams: Gegenbauer polynomials technique in x space, 9:4016 (RA;SU;In Russian)
**Kato, Yoshiaki,** *See* Yamada, Kawakatsu, 9:4061
**Katsumata, H.,** Quark mixing matrix in a composite model, 9:3788 (J;US)
**Katsuta, Hiroji,** *See* Ohno, Hideo, 9:2828
**Katz, J.J.,** *See* Brown, C.E., 9:3351
**Katzenstein, A.M.,** *See* Danti, K., 9:2155
**Kaufman, L.,** *See* Schmid, F., 9:2121
**Kaufman, S.B.,** Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles, 9:3928 (RA;US)
**Kaufmann, K.J.,** *See* Overfield, R.E., 9:3017
**Kaufmann, P.,** *See* Zodi, A.M., 9:3473
**Kaufmann, W.B.,** Nuclear medium effects in pion elastic scattering and charge exchange, 9:3886 (J;US)
**Kawabata, S.,** Test of lead glass shower counters, 9:3198 (R;US)
**Kawahata, K.,** *See* Ohkubo, K., 9:4064
**Kawai, N.,** Joint timing analysis of A0535 + 26 at 1980 outburst, 9:3453 (R;US)
**Kawasaki, Hiromitsu,** APPLE-2: an improved version of APPLE code for plotting neutron and gamma ray spectra and reaction rates, 9:3182 (R;JP)
**Kawasaki, Ken,** *See* Furukane, Utaro, 9:4063
**Kawata, Shigeo,** *See* Yamaguchi, Seiya, 9:4170
**Kay, B.D.,** Isotope enrichment during the formation of water clusters in supersonic free jet expansions, 9:2958 (J;US)
**Kaye, H.S.,** Quark flavor identification in electron-positron annihilation, 9:3713 (R;US)
**Kazai, L.,** Physical investigation on the postoperative chest wall irradiation with tangential cobalt moving beam, 9:3372 (RA;HU;In Hungarian, English)
**Kazakov, D.I.,** Some results of the summation of constant sign asymptotic series of perturbation theory, 9:4015 (RA;SU;In Russian)
**Kazanas, D.,** Electron-positron annihilation and the cosmic X-ray background, 9:3469 (R;US)
**Kazimi, M.S.,** Safety methodology and risk targets, 9:4167 (RA;XA)
**Kazmerski, L.L.,** *See* Wager, J.F., 9:2868
**Keane, A.T.,** Calibration of a decay-product collection and counting apparatus for the determination of exhaled thoron, 9:3204 (J;GB)
**Keating, H.,** *See* Lauf, R.J., 9:2677
**Keddar, A.,** *See* Menlove, H.O., 9:2062
**Kehres, L.A.,** *See* Smith, K.M., 9:2998
**Kelemen, J.,** *See* Monoki, E., 9:3369
*See* Treer, T., 9:3371
**Kelin, W.,** *See* Xinzhou, L., 9:3831
**Kelkar, B.,** *See* Albal, R., 9:1768
**Kelleher, P.J.,** *See* Miliaras, E.S., 9:2190
**Keller, B.L.,** Effects of a controlled fire on small rodent populations in a sagebrush community, 9:3314 (RA;US)
Long-term studies of relative density of rodents on the Idaho National Engineering Laboratory, 9:3322 (RA;US)
*See* Filipovich, M.A., 9:3297
*See* Groves, C.R., 9:3296
*See* Veith, R.D., 9:3299
**Keller, R.A.,** Optogalvanic response to light: photon energy vs photon number; comments, 9:3600 (J;US)
*See* Nogar, N.S., 9:3194
**Kelley, G.G.,** *See* Kulchar, A.G., 9:4079
**Kelley, N.D.,** Aerodynamic sources of acoustic radiation from a single MOD-2 wind turbine, 9:2186 (R;US)
**Kelley, R.D.,** Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2088 (J;US)
**Kelly, A.,** *See* Smith, R., 9:3077
**Kelner, S.R.,** *See* Aharonian, F.A., 9:3449
**Kemmler, G.,** *See* Wieczorek, H., 9:1951
**Kemper, P.R.,** *See* Jarrold, M.F., 9:3583
**Kendrick, K.,** *See* Balaes, A.M.E., 9:2897
**Kenik, E.A.,** *See* Lawless, K., 9:2802
**Keniry, M.A.,** Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3353 (J;US)
**Kennedy, S.D.,** *See* Farneth, W.D., 9:3026
**Kennedy, W.E. Jr.,** Potential low-level waste disposal limits for fusion radionuclides, 9:2066 (R;US)
**Kepak, F.,** Testing of the filtration efficiency of a silica gel packing for capture of cesium aerosol, 9:1957 (RA;XA)
**Kephart, R.,** *See* Wands, R., 9:3079
**Kerr, W.,** *See* Jamali, K., 9:2504
**Kessler, D.A.,** *See* Brower, R.C., 9:3853, 9:4028
**Kesten, M.,** *See* Windgassen, K.F., 9:2756
**Kestin, J.,** Improvement in the design and extension of operating range of viscometers and thermal conductivity cells. Annual technical progress report, 9:3209 (R;US)
**Kestner, N.R.,** Calculations on spin-paired species in metal-ammonia solutions, 9:2944 (J;US)
**Ketterson, J.B.,** *See* Miyano, K., 9:2993
*See* Qian, Y.J., 9:2746
**Kevan, L.,** *See* Li, A.S.W., 9:3018
**Kewisch, J.,** Simulation of electron spin depolarisation with the computer code SITROS, 9:3137 (R;DE)
**Key, C.R.,** *See* Acquavella, J.F., 9:3395
**Khachaturyan, M.N.,** *See* Arkhipov, V.V., 9:3638
**Khalil, M.A.,** *See* Starling, K.E., 9:1790
**Khan, M.A.,** *See* Starling, K.E., 9:1790
**Khandker, A.,** Absorption of radiation propagating obliquely in a magnetoplasma, 9:4128 (J;US)
**Khanna, K.M.,** Radial distribution function and second virial coefficient for interacting bosons, 9:4060 (R;XA)
**Khater, A.F.,** Brillouin scattering theory by bending in rough surfaces, 9:3987 (RA;BR;In Portuguese)

Kapitza resistance theory, 9:3532 (RA;BR;In Portuguese)
Momentum transfer in a Brillouin surface scattering, 9:3530 (RA;BR;In Portuguese)
**Khattak, C.P.,** Silicon crystal growth in vacuum, 9:2120 (R;US)
Single crystal growth of upgraded metallurgical silicon by HEM for photovoltaic applications, 9:2122 (R;US)
*See* Schmid, F., 9:2119, 9:2121
**Khelashvili, A.A.,** Gauge invariant Delbourgo approximation and gluon propagator, 9:3763 (RA;SU;In Russian)
**Khomenko, B.A.,** *See* Krumshtejn, Z.V., 9:3185
**Khovanskij, N.N.,** *See* Krumshtejn, Z.V., 9:3185
**Khoze, V.A.,** *See* Azimov, Ya.I., 9:3765
**Khriplovich, I.B.,** *See* Flambaum, V.V., 9:3818
**Khrushchev, V.V.,** One method to calculate of color factors of Feynman diagrams, 9:3812 (R;SU;In Russian)
**Khrushchov, V.V.,** Properties of scalar constituents of hadrons with respect to SU(2)sub(L)xU(1) group, 9:3813 (R;SU)
**Khrushev, V.V.,** *See* Leznov, A.N., 9:4009
**Khuri-Yakub, B.T.,** *See* Baer, R.L., 9:3080
**Khvedelidze, A.M.,** *See* Kvinikhidze, A.N., 9:3766
**Kiefer, R.D.,** *See* Bingham, G.E., 9:2906
*See* Koopman, R.P., 9:1885
**Kielczewska, D.,** *See* Saha, A., 9:3734
**Kiger, S.A.,** Design validation experiments for the key worker blast shelter, 9:3068 (RA;US)
DIRECT COURSE blast shelter entranceway and blast door experiments, 9:3062 (RA;US)
**Kilgroe, J.D.,** *See* Wright, C.R., 9:1804
**Killeen, J.,** *See* Cohen, B.I., 9:4129
**Kilroy, W.P.,** *See* Smith, P.H., 9:2523
**Kim, B.,** Kinetic features of an intraresin reaction, 9:2995 (J;US)
**Kim, J.H.,** *See* Hassan, Y.A., 9:2238
**Kim, N.K.,** Catalysts for upgrading solvent refined lignite, 9:1784 (D;US)
**Kim, S.,** *See* Smith, R., 9:3077
**Kim, Y.,** *See* Koh, I.G., 9:3752
**Kim, Y.C.,** *See* Chung, M.K., 9:4182
**Kimura, Hideo,** *See* Banba, Tsunetaka, 9:1992
**Kincaid, J.M.,** Enskog theory for multicomponent mixtures. II. Mutual diffusion, 9:3604 (J;US)
**King, D.A.,** *See* Molz, F.J., 9:2522
**King, F.K.,** *See* Palen, A.H., 9:2428
**King, J.C.,** Modification of point defects in quartz for device applications, 9:2835 (R;US)
**King, J.S.,** *See* Wehe, D.K., 9:2374
**King, N.S.P.,** *See* Bowman, J.D., 9:3914
*See* Castaneda, C.M., 9:3894
*See* Ullmann, J.L., 9:3917
**King, S.E.,** Effects of the $^3$He D state in the reaction $^2$H(p,$\gamma$)$^3$He, 9:3873 (J;US)
*See* FitzPatrick, V.F., 9:2004
**Kinnear, J.E.,** *See* Romney, E.M., 9:3304
**Kino, G.S.,** *See* Baer, R.L., 9:3080
**Kinoshita, K.,** *See* Alam, M.S., 9:3719
**Kirby, S.H.,** *See* Heard, H.C., 9:2761
**Kiritani, Michio,** Ion irradiation damage of metals, 9:4179 (RA;JP;In Japanese)
**Kirol, L.D.,** *See* Childs, F.W., 9:2180
**Kirsch, L.,** *See* Jenkins, C.M., 9:3727
**Kirste, B.,** ENDOR study of bis(acetylacetonato)copper(II) in solid solution, 9:2962 (J;US)
**Kirszensztejn, P.,** *See* Kim, B., 9:2995
**Kirtman, B.,** Metallic surface description in a localized representation, 9:2695 (RA;BR;In Portuguese)
**Kiselev, V.P.,** *See* Bol'shov, L.A., 9:4163
**Kiselevich, I.L.,** *See* Aleshin, Yu.D., 9:3633
**Kissel, L.,** Shape functions for atomic-field bremsstrahlung from electrons of kinetic energy 1—500 keV on selected neutral atoms $1<$ or $=Z<$ or $=92$, 9:3572 (J;US)
**Kitagawa, Mitsuo,** Stopping power and effective charge of low-velocity ions in metals, 9:4177 (RA;JP;In Japanese)
**Kitahara, T.,** *See* Watanabe, K., 9:3096
**Kitchens, C.W. Jr.,** *See* Mark, A., 9:3255
**Kittrell, C.,** Two-photon excitation of the D $^1\Delta$—X $^1\Sigma^+$ transition in carbon monoxide, 9:3580 (J;US)
**Klaja, D.R.,** Search for neutrino oscillations: present experimental data and future experiments, 9:3631 (RA;SU)
**Klarman, A.F.,** *See* Loveland, O.M., 9:1868
**Klaua, M.,** *See* Baars, H.G., 9:3362
**Klausen, T.,** *See* Soenju, O.K., 9:2098
**Klebesadel, R.W.,** Log N-log S is inconclusive, 9:3454 (R;US)
**Kleier, D.A.,** *See* Engelke, R., 9:2980
**Kleiman, G.G.,** Electronic structure of metallic alloys through Auger and photoemission spectroscopy, 9:2693 (RA;BR)
**Klein, M.,** Volatilization and trapping of ruthenium during calcination of nitric acid solutions, 9:1960 (RA;XA)
**Kley, H.,** Layout of the components: Primary system components (class I), 9:2422 (R;DE)
**Kliman, Ya.,** *See* Bogdzel', A.A., 9:3190
**Knaab, H.,** *See* Garzarolli, F., 9:2215
**Knapik, E.,** *See* Arkhipov, V.V., 9:3638
**Knapp, F.F. Jr.,** *See* Rayudu, G.V.S., 9:3047
**Knapp, G.S.,** *See* Pan, H.K., 9:2979
*See* Radousky, H.B., 9:2789
**Knecht, K.,** *See* Garzarolli, F., 9:2215
**Knick, S.T.,** Ecology of exploited and unexploited bobcat population in southeastern Idaho, 9:3346 (RA;US)
**Knickle, H.N.,** Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, June 1, 1983-August 31, 1983, 9:1765 (R;US)
**Knight, A.P.,** Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis, 9:1927 (R;GB)
**Knowles, G.,** Spectrophotovoltaic orbital power generation. Final Report, August 1981-November 1982, 9:2139 (R;US)
**Knowles, J.H.,** *See* Dietz, C.F., 9:1896
**Knowlton, D.E.,** Status, direction, and critical issues of waste treatment technology, 9:2003 (R;US)
**Knutson, C.F.,** Some geological modeling aspects of reservoir simulation, 9:1873 (RA;US)
**Kohan, J.,** Comparison of neutron transport calculations with NRC test results. Final report, 9:2328 (R;DE;In German)
**Kobayashi, R.,** High P/T phase and volumetric behavior of coal-liquid constituents. Quarterly report, July 1, 1983-September 30, 1983, 9:1792 (R;US)
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2084 (R;US)
Solubility-limited transport of radionuclides through fractured rock, 9:2024 (J;US)
*See* Hong, J.H., 9:2083
**Kobisk, E.H.,** *See* Adair, H.L., 9:3165
**Kocevar, P.,** Progress report 1981/82, 9:3861 (R;AT;In German)
**Koch, C.C.,** Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying, 9:2714 (J;US)
**Koch, K.H.,** *See* Hrovat, M.F., 9:2361
**Kochendarfer, R.A.,** Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2222 (R;US)
**Kocher, D.C.,** Dose-rate conversion factors for external exposure to photons and electrons, 9:3398 (J;GB)
**Koclas, J.,** Subnoding technique in the context of the analytic nodal method, 9:2326 (RA;CA)
**Kodaira, Tsuneo,** *See* Matsumoto, Masakatsu, 9:3098
**Koehler, D.R.,** *See* King, J.C., 9:2835
**Koehler, W.C.,** *See* Burlet, P., 9:2779
**Koester, R.,** *See* Vejmelka, P., 9:1986
**Koh, I.G.,** Global quantity for dyons with various charge distributions, 9:3752 (R;XA)
**Kohn, H.W.,** Pacing and logistics of high-level waste disposal, 9:2031 (J;US)
**Kohonen, K.,** Intermittent heating of buildings, 9:2633 (R;FI;In Finnish)
**Kohonen, R.,** Transient analysis of the thermal and moisture physical behaviour of building constructions, 9:2634 (R;FI)
**Koiller, B.,** *See* Majlis, N., 9:3984
*See* Mariz, A.M., 9:2696
**Koizumi, Y.,** *See* Grush, W.H., 9:2408
*See* Varacalle, D.J. Jr., 9:2411
**Kokubu, M.,** *See* Yoshida, Y., 9:2385
**Kolaczkowski, A.M.,** *See* Harper, F.T., 9:2457
**Kolar, M.,** *See* McKee, C., 9:2195
**Kolb, G.J.,** Insights from the Arkansas Nuclear One (ANO) unit one IREP analysis, 9:2497 (BA;US)
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2456 (R;US)
Systemic event tree methodolgoy employed in the Interim Reliability Evaluation Program (IREP), 9:2498 (BA;US)
**Kolchin, A.G.,** *See* Belyakov, V.A., 9:4187
**Kolesov, I.V.,** *See* Oganesyan, Yu.Ts., 9:3126
**Kolesznyikova, E.,** Computer tomography of abdominal tumours, 9:3366 (RA;HU;In Hungarian, English)
**Kollman, W.,** *See* Edwards, C., 9:3728

**Kollmar, W.,** Core design with respect to the safety concept, 9:2436 (R;DE)
**Komaki, Ken-ichiro,** Identification and lattice location of low-Z impurities implanted into solids, 9:4178 (RA;JP;In Japanese)
**Komarek, P.,** *See* Arendt, F., 9:4168
**Komarov, F.F.,** *See* Burenkov, A.F., 9:3967
**Komoriya, H.,** *See* Morris, E.E., 9:2491
**Komurka, M.,** Design, operation and in-plant testing of off-gas cleaning systems at BWRs, 9:2208 (RA;XA)
**Kondo, K.,** *See* Baum, G., 9:3717
**Kondo, Tatsuo,** *See* Tsuji, Hirokazu, 9:3099
**Konishi, Satoshi,** *See* Ohno, Hideo, 9:2828
**Konitzer, D.G.,** Example of the use of combined techniques of analytical transmission electron microscopy for phase identification, 9:2755 (BA;US)
**Kononenko, V.I.,** *See* Berezhnyj, V.L., 9:4076
**Konya, A.,** Angiography of hormone producing tumours of pancreas, 9:3364 (RA;HU;In Hungarian, English)
**Konyukhova, N.B.,** *See* Belova, T.I., 9:3838
**Konyushevskaya, R.I.,** *See* Zhilin, P.A., 9:4189
**Koonin, S.E.,** *See* Balantekin, A.B., 9:3882
**Koopman, R.P.,** LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices, 9:1885 (R;US)
*See* Bingham, G.E., 9:2906
**Kooser, J.C.,** Regulation and system interdependence: effects on the siting of California electrical energy facilities, 9:2573 (R;US)
**Kopcsanyi, Z.,** *See* Szilvasi, I., 9:3368
**Koplik, J.,** *See* Brower, R.C., 9:4028
**Korenchenko, S.M.,** *See* Baranov, V.A., 9:3187
*See* Evtukhovich, P.G., 9:3186
**Korhonen, R.,** Energy economical improvement of an oil heating system, 9:2631 (R;FI;In Finnish)
**Kornienko, Yu.N.,** Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2204 (R;SU;In Russian)
**Koske, J.E.,** *See* Varacalle, D.J. Jr., 9:2411
**Kosmatyi, Yu.E.,** *See* Roms, Yu.G., 9:2774
**Kostoff, R.N.,** *See* Bohachevsky, I.O., 9:4221
**Koszykowski, M.L.,** *See* Noid, D.W., 9:3585
**Kotov, Yu.D.,** *See* Aharonian, F.A., 9:3449
**Kottenmeier, W.,** *See* Siegel, S.M., 9:3423
**Kouvel, J.S.,** *See* Radousky, H.B., 9:2789
**Kovacs, W.J.,** TRISO-coated HTGR fuel pressure-vessel performance models, 9:2244 (R;US)
**Kowalski, L.,** Onset of damping in energetic heavy-ion interactions, 9:3903 (J;US)
**Kozak, J.J.,** Chaos, periodic chaos, and the random-walk problem, 9:3995 (J;US)
*See* Hatlee, M.D., 9:2999
**Kozlovski, Z.A.,** *See* Ditrikh, Yu., 9:3150
**Kozub, T.A.,** *See* Schilling, G., 9:4145
**Krajewski, P.,** *See* Krzesniak, J.W., 9:3175
**Krajnov, E.V.,** *See* Glushak, N.S., 9:2393
**Krajnovich, D.,** *See* Huisken, F., 9:3022
**Krakowski, R.A.,** *See* Bathke, C.G., 9:4210
*See* Hagenson, R.L., 9:4211, 9:4212
*See* Iso, Y., 9:4205
*See* Miller, R.L., 9:4184
**Kramer, J.M.,** LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2296 (J;US)
**Kramer, L.S.,** *See* Lintvedt, R.L., 9:3002
**Kramer, R.,** Calculation of dose from external photon exposures using reference human phantoms and Monte-Carlo methods. Pt. 1, 9:3979 (R;DE)
**Krampen, M.,** *See* Schempp, D., 9:2143
**Krantz, E.,** *See* Harper, F.T., 9:2457
**Krasnikov, N.V.,** CP invariance problem in the quantum chromodynamics, 9:3764 (RA;SU;In Russian)
**Krasnov, Y.K.,** *See* Campbell, L.J., 9:3614
**Krause, H.,** Introduction - types and quantitites of nuclear waste - principles of waste management, 9:1966 (R;DE)
**Kraushaar, J.J.,** *See* Ullmann, J.L., 9:3917
**Kravchenko, A.F.,** *See* Gajsler, V.A., 9:2830
**Krein, M.S.,** *See* Berman, M., 9:2452
**Kreiss, W.T.,** Global-scale obscuration by mass fire smoke, 9:3248 (RA;US)
**Krejsa, P.,** Sea dumping of radioactive wastes. Part 1: Basic considerations of marine environment, 9:1996 (R;AT;In German)
Sea dumping of radioactive wastes. Part 2: Behaviour of radionuclides in seawater, 9:1997 (R;AT;In German)
Sea dumping of radioactive wastes. Part 3: Dumping practice and radioecology, 9:1998 (R;AT;In German)
**Krenzinger, A.,** Physical mechanisms responsible by the spectral properties of selective surfaces, 9:2781 (RA;BR;In Portuguese)
**Krieger, C.,** *See* Smith, R., 9:3077
**Krmpotic, F.,** *See* Nakayama, K., 9:3947
**Krolikowski, W.,** Are lepton and quark families quantized dynamical systems, 9:3748 (R;XA)
**Krumbein, A.D.,** *See* Eliezer, S., 9:4161
**Krumhansl, J.A.,** *See* Horowitz, B., 9:3845
**Krummacher, S.,** *See* Colbert, J., 9:2739
**Krumshtejn, Z.V.,** Multiparticle event selection with neutral strange particle production. The electronic system of the RISK spectrometer, 9:3185 (R;SU;In Russian)
**Kruse, L.W.,** Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material, 9:2063 (J;US)
**Kryger, B.,** Boron carbide in pile behaviour Rapsodie experience, 9:2778 (R;FR)
**Krzesniak, J.W.,** Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment, 9:3175 (RA;XA)
**Kubas, G.J.,** Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_3(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2945 (J;US)
**Kuchinskij, A.A.,** *See* Burtsev, V.A., 9:4078
**Kudinov, A.V.,** *See* Goloskokov, S.V., 9:3767
**Kudo, Hiroshi,** Trapping-detrapping phenomena of hydrogen, helium and their isotopes into or from materials, 9:4172 (RA;JP;In Japanese)
**Kuehn, D.W.,** Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1789 (R;US)
**Kuen, I.,** *See* Rozsa, K., 9:3087
**Kuenning, R.W.,** *See* Orzechowski, T.J., 9:3158
**Kuenzel, H.,** Thermal insulation ordinance and utilization of solar energy, 9:2601 (RA;DE;In German)
**Kuester, H.,** *See* D'Agostini, G., 9:3625
**Kuffer, K.P.,** Operating experience with light-water reactors in Switzerland, 9:2314 (J;US)
**Kugel, H.W.,** *See* Schilling, G., 9:4145
**Kuhn, W.,** *See* Schimetschka, E., 9:2417, 9:2435
**Kukko, M.,** *See* Alaealmi, M., 9:2655
**Kulak, R.F.,** *See* Seidensticker, R.W., 9:2302
**Kulchar, A.G.,** Preionization and start-up in the ISX-B tokamak using electron cyclotron heating at 28 GHz, 9:4079 (R;US)
**Kulcinski, G.L.,** Fusion materials. Adapting to realistic reactor environments, 9:4222 (BA;XA)
*See* Bullen, D.B., 9:2731
*See* Iso, Y., 9:4205
*See* Sviatoslavsky, I.N., 9:4225
**Kuleshov, S.P.,** *See* Goloskokov, S.V., 9:3767
**Kulkarni, A.,** *See* Albal, R., 9:1768
**Kull, J.,** Linear Fresnel lens photovoltaic concentrator program, 9:2125 (R;US)
**Kulsrud, R.M.,** Fusion reactor plasmas with polarized nuclei, 9:4134 (BA;XA)
**Kumakhov, M.A.,** *See* Burenkov, A.F., 9:3967
**Kumar, K.H.,** *See* Starling, K.E., 9:1790
**Kumar, V.,** Surface effect theory in binary alloys: surfaces with cut-off, 9:3519 (RA;BR;In Spanish)
**Kunasz, P.B.,** Time-dependent scattering in resonance lines, 9:3974 (J;US)
**Kundt, W.,** Activity in the centers of galaxies, 9:3496 (BA;DE)
**Kunii, S.,** *See* Burlet, P., 9:2779
**Kunselman, R.,** Magnetic moment of the negative sigma hyperon: sigma hyperon-nucleus interactions, 9:3702 (RA;US)
Omega-minus atoms, 9:3703 (RA;US)
*See* Welsh, R.E., 9:3653
**Kurennoy, S.S.,** *See* Arbuzov, V.A., 9:3757
**Kurihara, K.,** Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3016 (J;US)
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2929 (J;US)

**Kurnit, N.A.,** Combination ring cavity and backward raman waveguide amplifier, 9:3086 (P;US)
**Kuroda, T.,** Experimental and analytical seismic study on 600 MWe CANDU core, 9:2433 (RA;CA)
**Kurtz, S.R.,** *See* Pike, G.E., 9:2841
**Kusno, D.,** Problem of the deuteron smearing corrections - 1: the conventional approach, 9:3750 (R;XA)
**Kusubov, A.S.,** *See* Abey, A.E., 9:3443
**Kutler, P.,** *See* Mark, A., 9:3254
**Kutschera, W.,** *See* Frekers, D., 9:3893
**Kuusela, J.,** *See* Siimes, H., 9:2130
**Kuvshinov, Yu.A.,** *See* Golovkin, S.I., 9:3382
**Kuz'michev, M.A.,** *See* Gann, V.V., 9:2548
**Kuzevanov, V.S.,** *See* Kornienko, Yu.N., 9:2204
**Kuzo, G.B.,** Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3335 (RA;US)
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3336 (RA;US)
**Kvale, T.J.,** *See* Rille, E., 9:3599
**Kvinikhidze, A.N.,** Large angle scattering for nonlocal quasi-potentials, 9:3766 (RA;SU;In Russian)
**Kwak, J.F.,** Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2856 (J;US)

## L

**L'Homme, M.,** *See* Artozoul, M., 9:2820
**LaBounty, J.F.,** Effects of operating the Mt. Elbert Pumped-Storage Powerplant on Twin Lakes, Colorado: 1981 report of findings. Technical report, 9:2100 (R;US)
**Lach, J.,** *See* Ankenbrandt, C., 9:3729
**Lachinov, V.M.,** *See* Viktorov, Yu.B., 9:3141
**Lackey, W.J.,** *See* Stinton, D.P., 9:2045
**Lagerkvist, B.,** Effect of arsenic on the system, 9:3413 (R;SE;In Swedish)
**Laget, J.M.,** Prospects in the study of very inelastic electronuclear reactions, 9:3737 (R;FR)
**Lagorce, M.,** Financial security and insurance for damage caused by use of the seabed for radioactive waste disposal, 9:1990 (R;FR;In French)
**Laguna, G.A.,** Direct absorption measurement of the spin-orbit splitting of the ground state in atomic fluorine, 9:3601 (J;NL)
Real-time detection of methyl radicals by diode laser absorption at 608 $cm^{-1}$, 9:3029 (J;NL)
**Laird, C.,** Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983, 9:2681 (R;US)
**Laitinen, L.,** *See* Sistonen, M., 9:2642
**Lake, L.W.,** *See* Schechter, R.S., 9:1918
**Lamain, L.G.,** Finite element part of the LAMCAL program. Elastic-plastic fracture mechanics applications, 9:2676 (R;XE)
**Lamb, J.D.,** *See* Izatt, R.M., 9:2909, 9:2910
**Lamb, R.S.,** *See* Cornuel, P., 9:1838
**Lambert, M.A.,** *See* Orrison, L.H., 9:3386
**Lamm, C.G.,** Isotope and radiation applications to agricultural development in Asia and the Pacific Region. Speech given during the seminar, 9:3389 (R;MY)
**Lancaster, H.,** *See* Alonso, J.R., 9:3135
*See* Howard, D., 9:3131
**Lande, K.,** Study of high-energy physics underground. Technical progress report, 9:3172 (R;US)
**Landman, U.,** *See* Barnett, R.N., 9:2718
**Landner, L.,** Systems for testing and hazard evaluation of chemicals in the aquatic environment - ESTHER. A background paper and a programme outline as a basis for the research plan in preparation, 9:3332 (R;SE)
**Landry, E.F.,** Accumulation of sediment-associated viruses in shellfish, 9:3425 (J;US)
**Lane, B.,** *See* Berk, H.L., 9:4135
**Lane, K.,** *See* Sallans, L., 9:3035
**Lang, D.D.,** *See* Turner, W.C., 9:4198
**Lang, J.R.A.,** BP development of tethered buoyant platform production system, 9:1836 (BA;GB)
**Langdon, A.B.,** Direct implicit large time-step particle simulation of plasmas, 9:4127 (J;US)
**Langer, G.,** *See* Schimetschka, E., 9:2417, 9:2435
**Langevin, M.,** *See* Bernas, M., 9:3899
**Langley, R.A.,** Modification for correcting a vacuum design fault in the Veeco Model MS 170 Leak Detector, 9:4192 (R;US)
**Langridge-Smith, P.R.R.,** *See* Morse, M.D., 9:3547
**Lanier, R.G.,** *See* Decman, D.J., 9:3931
**Lanquetin, B.,** *See* Falcimaigne, J., 9:1837
**Lanzano, G.,** *See* Bozek, E., 9:3876
**Lappi, M.,** Propertier of indigenous fuels. Part 3. Readily volatile compounds of peat, 9:1795 (R;FI;In Finnish)
**Lappin, J.P.,** *See* Cornuel, P., 9:1838
**Lapre, J.F.,** Development of a recovery method for Adriatic Sea heavy oil reservoirs, 9:1824 (BA;GB)
**Larkin, B.J.,** *See* Pepper, J.C., 9:2170
**LaRoe, P.R.,** *See* Rosenberg, R.A., 9:2853, 9:2936
**Laros, J.,** *See* Klebesadel, R.W., 9:3454
**Larsen, E.W.,** Order of the linear instability of a plasma, 9:4130 (J;US)
**Larsen, J.T.,** *See* Tarvin, J.A., 9:4201
**Larsen, R.C.,** Quark search at the CBA, 9:3616 (R;US)
*See* Black, J.K., 9:3168
**Larsen, V.E.,** *See* Dietz, C.F., 9:1896
**Larson, B.C.,** Diffuse x-ray scattering for the study of defects in silicon, 9:2884 (BA;NL)
**Larson, D.A.,** Large urban fire environment: trends and model city predictions, 9:3239 (RA;US)
*See* Brode, H.L., 9:3234
*See* Small, R.D., 9:3238
**Larson, D.C.,** *See* Bell, Z.W., 9:3898
**Larson, K.M.,** *See* Way, J.D., 9:1880
**Larson, V.H.,** A study of dynamic energy equations for Stirling cycle analysis. Final Report, 9:2673 (R;US)
**Latz, P.,** *See* Herzog, T., 9:2604
**Lau, S.S.,** *See* Stritzker, B., 9:2750
**Laude, F.,** *See* Jacquet-Francillon, N., 9:1952
**Laude, J.P.,** Apparatus for enrichment of uranium by double photoionization, 9:1922 (TG;US)
**Lauer, E.J.,** *See* Chong, Y.P., 9:3143
*See* Prono, D.S., 9:3144
**Lauf, R.J.,** Preliminary electron microscopic study of thermal-shock-resistant ceramic-metal composites, 9:2810 (BA;US)
Preparation of ceramic particulates for transmission electron microscopy, 9:2677 (BA;US)
Preparation of particulates for transmission electron microscopy: an update, 9:2801 (BA;US)
**Laughlin, D.E.,** *See* Hwang, M., 9:2684
**Laughon, R.B.,** Application of oil exploration techniques toward finding a nuclear waste repository site, 9:2046 (J;US)
**Laurendeau, N.M.,** *See* Lucht, R.P., 9:3058
**Laurent, J.,** Wide diameter flexible pipe with high performances and long lengths for great depths, 9:1864 (BA;GB)
**Laurikainen, P.,** *See* Ankenbrandt, C., 9:3729
**Laviron, A.,** Radiation effects on the reliabiliaty of microprocessors and associated circuits, 9:3207 (R;FR;In French)
**Lawless, K.,** Microstructure of vanadium-oxygen alloys, 9:2802 (BA;US)
**Lawrence, L.A.,** Performance of high plutonium weight fraction mixed-oxide fuel, 9:2299 (J;US)
**Lawrence, W.T.,** Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2623 (R;US)
**Le Bihan,** Laying pipelines by the RAT method, 9:1866 (BA;GB)
**Le Metayer, C.,** *See* Alamanos, N., 9:3889
**Lebedev, D.R.,** Generalized internal long wave equations: construction, hamiltonian structure and conservation laws, 9:4018 (R;SU)
**Lebovitz, R.M.,** Influence of chronic exposure to low level pulsed microwave radiation on performance and cognitive behavior. Final report, 9:3430 (R;US)
**Leclaire, R.,** *See* Cohn, D.R., 9:4207
**Leclercq, J.,** Mines Safety and Health Commission for the mining and other extractive industries. Its role in oil and gas exploration and extraction, 9:1853 (BA;GB)
**Lederman, L.,** Licensing of nuclear power plants in Brazil, 9:2305 (R;DE)
**Ledinegg, E.,** Progress report 1979-1981, 9:2322 (R;AT;In German)
**Lee, B.S.,** Oxidation-related strength loss in HTGR graphites, 9:2255 (J;US)
**Lee, D.K.,** *See* Hastings, D.E., 9:4080
*See* Stubbins, J.F., 9:2257
**Lee, E.K.C.,** *See* Holtermann, D.L., 9:3012
**Lee, J.C.,** *See* Losey, D.C., 9:2373
**Lee, J.D.,** *See* Moir, R.W., 9:4216
**Lee, K.T.,** *See* Bowman, J.M., 9:2922
**Lee, K.W.,** *See* Chung, M.K., 9:4182
**Lee, L.C.,** *See* Sydora, R.D., 9:4107
**Lee, L.L.,** Perturbation theories for the dipolar fluids, 9:2950 (J;US)
*See* Starling, K.E., 9:1790

**Lee, M.A.,** Nuclear data sheets for A = 153, 9:3924 (J;US)
**Lee, M.H.,** Can the velocity autocorrelation function decay exponentially?, 9:4025 (J;US)
Derivation of the generalized Langevin equation by a method of recurrence relations, 9:4027 (J;US)
**Lee, S.P.,** Fire protection program in CANDU stations, 9:2432 (RA;CA)
**Lee, T.,** *See* Beri, A.C., 9:2788
**Lee, X.S.,** *See* Tsang, K.T., 9:4113
**Lee, Y.H.,** Kinetic studies of enzymatic hydrolysis of insoluble cellulose: (II) analysis of extended hydrolysis times, 9:2132 (J;US)
**Lee, Y.T.,** *See* Hepburn, J.W., 9:3014
*See* Huisken, F., 9:3022
**Leffler, P.,** Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3412 (R;SE;In Swedish)
**Legrain, R.,** *See* Bozek, E., 9:3876
*See* Cassagnou, Y., 9:3875
**Lehman, G.L.,** *See* Sklad, P.S., 9:2803
**Leibowitz, L.,** Thermophysical properties of reactor fuels, 9:1932 (BA;US)
*See* Fink, J.K., 9:1931, 9:2775
**Leigh, R.W.,** Breakeven costs of storage in optimized solar energy systems, 9:2153 (J;GB)
**Leipuner, L.B.,** *See* Black, J.K., 9:3168
*See* Larsen, R.C., 9:3616
**Leitner, P.,** Environmental assessment for spill tests of $NH_3$ and $N_2O_4$ at Frenchman Flat, Nevada Test Site. Revision 1, 9:3273 (R;US)
**Lekach, S.V.,** *See* Wulff, W., 9:2462
**Lembong, J.T.,** Therapeutic effects of radiotherapy of carcinoma of corpus uteri and cervix in the years 1967-1972, 9:3361 (R;DE;In German)
**Lemons, D.S.,** Collisional modification to the exospheric theory of solar wind halo electron pitch angle distributions, 9:3481 (J;US)
*See* Jones, M.E., 9:4109
**Lenahan, P.M.,** Effects of light and modulation frequency on spin-dependent trapping at silicon grain boundaries, 9:2834 (R;US)
**Leon, M.,** Exotic atoms and hyperon properties, 9:3701 (RA;US)
Hadronic atoms: the hadron-nucleus strong interaction, 9:3651 (RA;US)
*See* Heffner, R.H., 9:3711
*See* MacLaughlin, D.E., 9:2726
**Leon, R.,** *See* Masson, M., 9:3292
**Leone, S.R.,** Infrared fluorescence: a versatile probe of state-selected chemical dynamics, 9:2964 (J;US)
**Leonhardt, W.,** *See* Allinger, J., 9:3076
**Lepage, G.P.,** *See* Brodsky, S.J., 9:3777
**Lerner, E.,** *See* Majlis, N., 9:3984
*See* Souza, J.L.D. de, 9:3529
**Lesikar, A.V.,** *See* Ingram, M.D., 9:2885
**Lestrat, P.,** Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants, 9:2284 (R;FR;In French)
**Leung, E.,** *See* Wands, R., 9:3079
**Leung, K.N.,** *See* Ehlers, K.W., 9:4105
**Leutwyler, S.,** van der Waals vibrational modes of the pentacenexR complexes (R = Ne, Ar, Kr), 9:3556 (J;US)
**Levac, D.P.,** *See* Mitchell, J.B.A., 9:3565
**Levallois, E.,** Rigid flowline connecting and laying tests, 9:1863 (BA;GB)
**Levenson, M.,** Realistic estimates of the consequences of nuclear accidents, 9:2430 (RA;CA)
**Leverenz, F.L. Jr.,** Development of a data base for quantification of accident sequences, 9:2495 (BA;US)
**Levi, C.,** *See* Alamanos, N., 9:3889
**Levich, B.G.,** *See* Babchin, A.J., 9:3991
**Levin, G.B.,** Low-level waste disposal technology, 9:2017 (J;US)
*See* Nern, C.F., 9:2009
*See* Romano, S.A., 9:1949
**Levin, P.,** *See* Elmroth, A., 9:2598
**Levine, H.,** *See* Brower, R.C., 9:4028
**Levine, R.Y.,** Symmetry and symmetry breaking in generalized parastatistics, 9:3852 (J;US)
**Levit, S.,** Phenomenology of shape transitions in hot nuclei, 9:3954 (R;IL)
**Levy, S.V.F.,** *See* Curado, E.M.F., 9:3525
**Lewe, P.,** *See* Altmann, J., 9:1941
**Lewis, C.W.,** *See* Stevens, R.K., 9:3271
**Lewis, J.W.,** Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3013 (J;US)
**Lewtas, J.,** *See* Mumford, J., 9:3418
**Leznov, A.N.,** Liouville supersymmetrical equation for a quantum case, 9:4009 (R;SU;In Russian)
Quantum theory of two-dimensional generalized Toda lattice on bounded spatial interval, 9:3834 (R;SU)
Two-dimensional exactly and completely integrable dynamic systems (Monopoles, instantons, dual models, relativistic strings, Lund-Regge model, generalized Toda lattice, etc), 9:4037 (R;SU)
*See* Fedoseev, I.A., 9:4008
**Li, A.S.W.,** Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3018 (J;US)
**Li, E.F.T.,** Ion exchange mechanism of cesium removal by cyanoferrates, 9:2048 (B;GB)
**Li, Y.,** *See* Santschi, P.H., 9:3340
**Liang, E.P.,** Analysis of the Konus catalog of gamma-ray bursts with the thermal synchrotron model, 9:3483 (J;US)
**Lichtenstadt, J.,** *See* Bowman, J.D., 9:3914
**Lichtenstein, T.L.,** *See* Rainer, F., 9:2747
**Lieb, B.J.,** *See* Liu, L.C., 9:3657
**Liebenberg, D.H.,** A new hydrostatic medium for diamond anvil cells to 300 kbar pressure, 9:2887 (J;NL)
*See* Mills, R.L., 9:2091
**Liebenthal, J.L.,** *See* Deis, G.A., 9:4158
**Lienau, P.J.,** Final administrative report for technology transfer and information dissemination, January 1, 1982-March 31, 1983, 9:2177 (R;US)
**Lietzke, A.F.,** *See* Jackson, G.L., 9:4202
**Liforov, V.G.,** *See* Glazkov, Yu.Yu., 9:3173
**Likhanskij, V.V.,** To the theory of non-adiabatic transitions between degenerated states, 9:4007 (R;SU;In Russian)
**Liljestrand, R.,** *See* Tinsley, J.R., 9:3933
**Lim, J.J.,** On issues important to the development of a systems interaction evaluation procedure, 9:2503 (BA;US)
**Lin, A.T.,** *See* Dawson, J.M., 9:4139
**Lin, C.D.,** Classification of doubly excited states of two-electron atoms, 9:3560 (J;US)
**Lin, C.P.,** *See* Tang, J., 9:2818
**Lin, J.,** *See* Huang, X., 9:3511
**Lin, K.H.,** Evaluation of coking behavior in coal liquefaction process equipment, 9:1782 (J;US)
**Lin, R.,** *See* Van Hove, M.A., 9:2862
**Lin, Sheng-Chi,** Simulation of fuelling operations for CANDU-type reactors, 9:2266 (RA;CA)
**Lin, W.H.,** Thermoviscous effects on acoustic scattering by thermoelastic solid cylinders and spheres, 9:4024 (J;US)
**Lind, V.G.,** Singles and coincidence $\gamma$-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3913 (RA;US)
**Lindberg, R.G.,** *See* Romney, E.M., 9:3304
**Linde, A. van der,** Fabrication, irradiation and post-irradiation examinations of $MO_2$ and $UO_2$ sphere-pac and $UO_2$ pellet fuel pins irradiated in a PWR loop, 9:2224 (R;XE)
**Linderholm, H.,** *See* Lagerkvist, B., 9:3413
**Lindgren, M.A.,** *See* Joyce, D.C., 9:3730
**Lindgren, R.A.,** Studies of spin excitations with electromagnetic and hadronic probes, 9:3904 (R;US)
**Lindinger, W.,** *See* Howorka, F., 9:3535
**Lindstrom, P.J.,** *See* Olson, D.L., 9:3883
**Lindvall, T.,** *See* Camner, P., 9:3416
**Linford, G.J.,** Large aperture harmonic conversion experiments at Lawrence Livermore National Laboratory, 9:4232 (J;US)
**Lingenfelter, R.E.,** The origin of the galactic annihilation radiation, 9:3470 (R;US)
**Link, B.W.,** Evaluation of nuclear facility decommissioning projects. Summary report: North Carolina State University Research and Training Reactor, 9:2394 (R;US)
**Linkevich, A.D.,** Relativistic wave functions of a nucleon as a quark-diquark bound state, 9:3771 (R;SU;In Russian)
**Lins, W.,** *See* Hoehlein, G., 9:1987
**Lintvedt, R.L.,** Reversible sequential transfer of two electrons at the same potential in bis(1,3,5-triketonato)dicopper(II) complexes and their diamine Schiff bases. Effect of $Na^+$ and similar ions on the cyclic voltammetry, 9:3002 (J;US)
**Lipari, P.,** *See* Chen, A., 9:3736
**Lipatov, L.N.,** *See* Bukhvostov, A.P., 9:3745
**Lipkin, H.J.,** Glueballs multiquark states and the OZI rules, 9:3781 (R;IL)
Magnetic moments of baryons, 9:3783 (R;IL)
**Lipkin, J.,** *See* Hinga, K.R., 9:2042
**Lipov, M.Yu.,** Calculation of temperature fields in the pulsed fusion reactor blanket elements, 9:4162 (R;SU;In Russian)
**Lisantti, J.,** *See* Tinsley, J.R., 9:3933
**Littenberg, L.,** Experiment to measure the decay K/sub L/$^0 \rightarrow \pi^0 e^+ e^-$, 9:3685 (RA;US)
**Little, R.,** Status of TFTR construction and proposed research plan, 9:4208 (BA;XA)

**Littlewood, I.M.,** *See* Cornell, M.C., 9:2869
**Liu, C.T.,** Effect of thorium additions on metallurgical and mechanical properties of Ir-0.3 pct W alloys, 9:2758 (J;US)
**Liu, D.K.,** Characterization and photochemistry of surface-confined mononuclear and trinuclear phosphine/carbonyl complexes of ruthenium(0). Interim technical report, 9:3003 (R;US)
**Liu, L.C.,** Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3657 (RA;US)
New scientific information from LAMPF II, 9:3912 (RA;US)
*See* Dropesky, B.J., 9:3911
**Liu, S.H.,** *See* Fu, C., 9:2721
**Liu, W.H.,** *See* Huang, H.W., 9:3218
**Liu, Y.Y.,** Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2469 (J;US)
Transient failure prediction for carbide TREAT test HC-3, 9:2258 (J;US)
**Livingston, R.,** *See* Zeldes, H., 9:3000
**Livingston, R.C.,** *See* Rino, C.L., 9:3502
**Lloyd, R.D.,** Radium retention in mature beagles injected at 5 years of age, 9:3404 (J;US)
**Lobanov, Yu.Yu.,** *See* Zhidkov, E.P., 9:4019
**Lobner, P.,** *See* Varnado, G.B., 9:2499
**Lockyer, N.S.,** Measurement of the lifetime of bottom hadrons, 9:3716 (J;US)
**Loesing, D.M.,** *See* Williams, J.M., 9:2819
**Loew, G.H.,** *See* Oie, T., 9:2972
**Logan, J.,** Ab initio study of electronic coupling in the aqueous $Fe^{2+}$—$Fe^{3+}$ electron exchange process, 9:2957 (J;US)
**Lohr, A.W.,** Development tendencies of passive systems, 9:2602 (RA;DE;In German)
**Lomon, E.L.,** Nucleon-nucleon interactions: quark dynamics, 9:3670 (RA;US)
**Long, A.,** Stable isotopic investigation of the ground water quality and transport systems in the Safford Valley, Arizona. Report for Oct 80-Sep 81, 9:2160 (R;US)
**Long, J.C.S.,** Investigation of equivalent porous medium permeability in networks of discontinuous fractures, 9:3442 (R;US)
**Longhurst, G.R.,** *See* Deis, G.A., 9:4158
**Longinow, A.,** Failure criteria for blast loads structures: a review, 9:3064 (RA;US)
Reliability of engineered basements as blast shelters, 9:3066 (RA;US)
Reliability of residential basements as blast shelters, 9:3067 (RA;US)
*See* Mohammadi, J., 9:3065
**Longo, M.J.,** *See* Ball, R.C., 9:3733
**Loong, C.,** *See* Stassis, C., 9:2742
*See* Thompson, J.R., 9:2743
**Lopez, C.F.,** Experience with hands-on training at the Los Alamos critical assemblies facility, 9:2398 (J;US)
**Lopez de Haro, M.,** *See* Kincaid, J.M., 9:3604
**Lorazo, B.,** Remarkable properties of the broken pair model 2 relation with the quasi-particle scheme, 9:3950 (R;FR)
**Lorenz, R.,** *See* Murphy, C.E. Jr., 9:3265
**Loring, C.M.,** *See* Kulchar, A.G., 9:4079
**Losey, D.C.,** Core physics analysis in support of the FNR HEU-LEU demonstration experiment, 9:2373 (RA;US)
**Loter, N.G.,** *See* Petrasso, R., 9:4142
**Louis, W.C.,** Experiment to study the decay $K^+ \rightarrow \pi^+$ nu anti nu, 9:3696 (RA;US)
**Love, P.E.,** Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies, 9:4241 (R;XE)
**Loveland, O.M.,** The use of fuel additives to control plume opacity of turbine engine test cells. Final report Mar 78-Oct 81, 9:1868 (R;US)
**Loven, J.S.,** *See* Keller, B.L., 9:3314
**Lowdermilk, W.H.,** *See* Milam, D., 9:2795
*See* Rainer, F., 9:2747
**Lowenberg, H.,** Environmental effects of the Clinch River Breeder Reactor fuel cycle, 9:2294 (J;US)
**Lowndes, D.H.,** *See* Jellison, G.E. Jr., 9:2855
**Lowry, J.F.,** Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83, 9:1884 (R;US)
**Lu, D.C.,** High-precision studies of exotic x rays from hadronic atoms with crystal diffraction spectrometers, 9:3654 (RA;US)
**Lu, P.H.,** *See* Babu, G.N., 9:3030
**Lu, S.C.,** Reliability analysis for stiff versus flexible piping, 9:2212 (R;US)
**Lubatti, H.J.,** *See* Chaloupka, V., 9:3694, 9:3695
*See* Goldman, T., 9:3679, 9:3691
**Lucas Luijckx, H.J.B.,** *See* Linde, A. van der, 9:2224
**Lucht, R.P.,** Temperature measurement by two-line laser-saturated OH fluorescence in flames, 9:3058 (J;US)
**Ludeking, L.,** *See* Auerbach, E.H., 9:3793
**Ludescher, C.,** *See* Budny, R., 9:4146
**Ludwig, P.,** *See* Delaunay, M., 9:4231
**Lueck, K.,** Optimization of a combustion motor driven heat pump (gas/oil) for power ranges up to 20kW thermal with variable sources of environmental energy in one- and two-family-houses (small heat pump), 9:2617 (R;XE;GE)
**Lundberg, R.,** *See* Carder, B., 9:4196
**Lundy, R.,** *See* Cooper, W., 9:3129
**Lung, H.C.,** *See* Chambre, P.L., 9:2023
**Luong, T.H.,** *See* Starling, K.E., 9:1790
**Lyajste, R.,** *See* Krumshtejn, Z.V., 9:3185
**Lyman, W.J.,** *See* Guswa, J.H., 9:3327
**Lynn, B.W.,** Order αGsub(μ) corrections to the parity-violating electron-quark potential in the Weinberg-Salam theory: parity-violations in one-electron atoms, 9:3811 (R;XA)
**Lynn, K.G.,** *See* Canter, K.F., 9:3514
**Lyon, R.B.,** Canada's contribution towards international consensus on nuclear fuel waste disposal, 9:1982 (RA;CA)
**Lyon, T.F.,** *See* Berry, D.A., 9:1859
**Lytle, R.J.,** Properties of the ground inferred from electromagnetic measurements, 9:3439 (J;US)

## M

**Ma, D.C.,** *See* Seidensticker, R.W., 9:2302
**Ma, L.J.,** Process and apparatus for the separtaion of isotopes, 9:1921 (TG;US)
**Maass, K.E.,** Safety assessment of fuel water disposal appropriate to the German waste management programme, 9:1980 (RA;CA)
**Mac Gregor, M.H.,** Z dependence of strongly interacting relativistic nuclear fragments, 9:3921 (J;US)
**MacCracken, J.G.,** Coyote-leporid relations on the Idaho National Engineering Laboratory, 9:3319 (RA;US)
Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis, 9:3286 (J;US)
**MacDonald, P.E.,** *See* McCardell, R.K., 9:2516
**MacDonald, R.,** *See* Chen, S.Y., 9:2371
**MacDonald, W.M.,** *See* Hsieh, T.C., 9:2881
**MacElroy, R.D.,** *See* Oie, T., 9:2972
**MacFarlane, D.,** *See* Chen, S.Y., 9:2371
**MacGregor, R.R.,** *See* Ferrieri, R.A., 9:3051
**Machida, M.,** Experimental study of high-beta tokamak stability, 9:4124 (J;US)
**Maciel, G.E.,** *See* Bronniman, C.E., 9:2817
*See* Liu, D.K., 9:3003
*See* Sindorf, D.W., 9:2948, 9:2954, 9:2968
**MacKenzie, D.,** *See* Maverick, A.W., 9:2947
**MacLachlan, J.,** *See* Ankenbrandt, C., 9:3729
**MacLaughlin, D.E.,** Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass, 9:2726 (J;US)
**MacLeod, G.K.,** Nuclear War, 9:3407 (J;US)
**Madden, H.H.,** Hydrogen chemisorption on silicon (100) 2 x 1, 9:2765 (J;NL)
**Maddox, W.L.,** Diode laser spectrometry for monitoring acetylene on-line in a liquefaction plant, 9:2895 (R;US)
**Madi Filho, T.,** Non destructive burn up determination of IEA-R1 reactor fuel elements by gamma-ray spectrometry using a Ge(Li) detector, 9:2401 (B;BR;In Portuguese)
**Madler, P.,** Short-range correlations in an extended time-dependent mean-field theory, 9:3953 (R;SU)
**Madoz, J.P.,** Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system, 9:2209 (RA;XA;In French)
**Maesaettae, J.,** *See* Kalema, T., 9:2147
**Maekinen, A.,** Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3415 (R;SE)
**Maekipaeae, M.,** Flue gas neutralization by adding gaseous ammonia, 9:2658 (R;FI;In Finnish)
**Maerk, T.,** *See* Howorka, F., 9:3535
**Magana, J.W.,** *See* Holt, J.B., 9:2766

**Magnier, A.,** *See* Jacquet-Francillon, N., 9:1952
**Magold, M.,** *See* Hoecker, K.H., 9:2540
**Magyary, S.,** *See* Alonso, J.R., 9:3135
**Mahaffey, J.A.,** *See* Sanders, C.L., 9:3405
**Mahler, H.J.,** Liquid time projection chamber, 9:3193 (RA;US)
*See* Allen, R.C., 9:3684
*See* Boehm, F., 9:3710
**Mahlum, D.D.,** *See* Wilson, B.W., 9:1817, 9:3420
**Maier, K.,** $K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3970 (RA;US)
**Maier, K.H.,** Conversion of sewage sludge by anaerobic elimination of the heterofunction, 9:2662 (R;DE;In German)
*See* Decman, D.J., 9:3931
**Maier, W.B. II,** Spectral studies of cold $UF_6$ solutions, 9:3552 (J;US)
*See* Holland, R.F., 9:3591
**Maillie, H.D.,** Solutions for the ICRP gastrointestinal activity from inhaled radioactive aerosols, 9:3406 (J;US)
*See* Cool, D.A., 9:3400
**Maj, J.J.,** *See* Garfunkel, E.L., 9:2932
**Majer, H.,** *See* Hoecker, K.H., 9:2540
**Majid, S.A.,** *See* Schneeberger, J.P., 9:2483
**Majling, L.,** How to populate bound hypernuclear levels, 9:3650 (RA;US)
**Majlis, N.,** Proceedings of the 1. Latin-American Colloquium of Surface Physics, 9:3984 (R;BR;In Portuguese)
*See* Anda, E.V., 9:3985
**Makarov, O.I.,** *See* Romanov, V.M., 9:3966
**Maki, A.,** CP symmetry in a high magnetic field, 9:3690 (RA;US)
**Makoveev, V.K.,** *See* Viktorov, Yu.B., 9:3141
**Makovsky, L.E.,** *See* Crawford, J.E., 9:2924
**Malacarne, M.,** Soft X-ray imaging diagnostic on the HBTX 1A reversed field pinch, 9:4041 (R;GB)
**Malakhov, A.I.,** *See* Arkhipov, V.V., 9:3638
**Malba, V.,** *See* Hoffman, M.Z., 9:3010
**Maldonado, E.A.B.,** *See* Janssen, J.E., 9:2636
**Malenfant, R.E.,** A program of hands-on training in the operation of a critical assembly facility, 9:2397 (J;US)
*See* Lopez, C.F., 9:2398
**Mallen, A.N.,** *See* Wulff, W., 9:2462
**Malley, M.M.,** *See* West, W.P., 9:3046
**Mallory, C.W.,** *See* Schultz, W.W., 9:2892
**Malm, H.L.,** Isotope specific noble gas monitoring, 9:3180 (RA;CA)
**Malyshev, A.B.,** *See* Avdyushin, S.I., 9:3459
**Mamedov, T.N.,** *See* Balandin, M.P., 9:3538
**Mamonov, V.N.,** *See* Viktorov, Yu.B., 9:3141
**Mamourian, M.,** Bimodal analysis and spatial control, 9:2327 (RA;CA)
**Mandel, T.,** *See* Kaindl, G., 9:2857
**Mandolesi, N.,** *See* Smoot, G.F., 9:3477
**Manheimer, W.M.,** *See* Colombant, D.G., 9:4115, 9:4123
**Manickam, J.,** *See* Izzo, R., 9:4120
**Manin, M.,** Attempt to control the frequency spectrum transmitted during the implosion generated by a steam gun in offshore seismics (VAPORCHOC), 9:1821 (BA;GB)
**Maninger, R.C.,** *See* Dorn, D.W., 9:4197
**Manka, C.K.,** *See* McLean, E.A., 9:4190
**Manley, O.P.,** *See* Foias, C., 9:3611
**Mann, F.M.,** *See* Kennedy, W.E. Jr., 9:2066
**Mann, G.,** Nondiagonal Z-decay - $Z \rightarrow$anti $e+\mu$, 9:3814 (RA;HU)
**Mann, L.G.,** *See* Decman, D.J., 9:3931
**Mann, R.,** *See* Landry, E.F., 9:3425
**Manning, M.R.,** *See* McCabe, W.J., 9:2158
**Mantell, D.A.,** Distribution of internal energy in CO and $CO_2$ vibrationally excited by a hot platinum surface, 9:3587 (J;US)
**Manteuffel, T.A.,** Optimal parameters for linear second-degree stationary iterative methods, 9:4256 (J;US)
**Mao, N.,** *See* Abey, A.E., 9:3443
**Mapalo, L.,** *See* Wands, R., 9:3079
**Maple, E.,** Geomagnetic pulsations-production/interpretation. Final scientific report 1 Sep 78-30 Sep 81, 9:3503 (R;US)
**Mara, G.L.,** Welding of uranium and uranium alloys, 9:2713 (R;US)
**Maraschin, R.,** *See* Kull, J., 9:2125
**Marcus, R.A.,** *See* Noid, D.W., 9:3585
**Marechal, B.,** *See* Contar, J.M.R., 9:3177
**Margetan, F.J.,** Formulae for configuration averages of products of one-body and two-body operators in many-fermion spaces, 9:4017 (R;US)
**Margolies, D.S.,** *See* Turner, W.C., 9:4198
**Marini, A.,** *See* Fernandez, E., 9:3723
**Mariz, A.M.,** Chemisorption of atomic hydrogen in nickel, 9:2696 (RA;BR;In Portuguese)
**Mark, A.,** Blast loading computations over complex structures, 9:3254 (RA;US)
Design of blast simulators for nuclear testing, 9:3255 (RA;US)
**Mark, J.E.,** Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks, 9:2814 (J;US)
**Markham, O.D.,** Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report, 9:3294 (R;US)
*See* Arthur, W.J., 9:3295, 9:3298
*See* Halford, D.K., 9:3334, 9:3399
*See* Kuzo, G.B., 9:3335, 9:3336
**Markowitz, S.S.,** *See* Oblath, S.B., 9:2965
**Marlette, G.M.,** Stability and succession in crested wheatgrass seedings on the Idaho National Engineering LAboratory, 9:3283 (RA;US)
**Marmar, E.,** *See* Petrasso, R., 9:4142
**Maroni, V.,** *See* Baker, C., 9:4219
**Maroni, V.A.,** *See* Papatheodorou, G.N., 9:3596
**Marriner, J.,** *See* Ankenbrandt, C., 9:3729
**Marron, J.F.,** *See* Deju, R.A., 9:2022
**Marron, M.T.,** *See* Goodman, E.M., 9:3431
**Martin, M.M.,** *See* Senn, R.L., 9:2358
**Martin, M.R.,** *See* Andersson, B., 9:2102
**Martin, R.L.,** All-electron relativistic calculations on AgH. An investigation of the Cowan-Griffin operator in a molecular species, 9:2963 (J;US)
**Martin, S.,** Flashover modeling for direct course, 9:3247 (RA;US)
**Martin, S.B.,** *See* Kanury, A.M., 9:3054
**Martin, W.E.,** *See* Linford, G.J., 9:4232
**Martin, W.R.,** *See* Losey, D.C., 9:2373
**Martinez, G.,** *See* Moraga, L.A., 9:3520
**Martinez, R.,** *See* Jarmie, N., 9:3146
**Maruhn, J.A.,** *See* Oberacker, V.E., 9:3938
**Masaike, a.,** Search for strange dibaryons at KEK and LAMPF II, 9:3644 (RA;US)
**Maskarinec, M.P.,** *See* Tomkins, B.A., 9:2890
**Maslov, V.A.,** *See* Berezhnyj, V.L., 9:4076
**Mason, A.S.,** *See* Mroz, E.J., 9:3275
**Mason, F.L.,** *See* Newman, L.W., 9:2223
**Mason, K.O.,** *See* Jensen, K.A., 9:3487
**Mason, W.J.,** *See* McCabe, W.J., 9:3435
**Massaro, S.A.,** Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2444 (R;US)
**Massey, R.G.,** *See* Mings, W.J., 9:2649
**Masson, M.,** In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant, 9:3292 (R;FR;In French)
**Masterson, T.G.,** *See* Ullmann, J.L., 9:3917
**Mathews, G.J.,** Gamow-Teller strength function for $^{90}$Zr: Effects of spin and isospin exchange forces, and ground-state correlations, 9:3919 (J;US)
*See* Becker, S.A., 9:3458
**Matinyan, S.G.,** *See* Asatryan, G.M., 9:3816
**Matis, H.S.,** *See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Matkowsky, B.J.,** *See* Kapila, A.K., 9:2976
**Matlock, D.K.,** *See* Olson, D.L., 9:2680
**Matsuda, Y.,** Numerical solution of the electron distribution function in tandem-mirror thermal barriers, 9:4100 (J;US)
**Matsui, H.,** *See* Yoshida, Y., 9:2385
**Matsumoto, Atsushi,** Determination of metastable fraction in an ion beam extracted from ECR plasma, 9:4073 (R;JP)
**Matsumoto, Masakatsu,** Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method, 9:3098 (R;JP;In Japanese)
**Matsuo, Tooru,** *See* Ohno, Hideo, 9:2828
**Matthews, G.J.,** Neutron capture rates in the r-process: the role of direct radiative capture[1], 9:3485 (J;US)
**Matumoto, Z.,** *See* Tasaka, K., 9:3915
**Maturana, G.,** *See* Brower, R.C., 9:3853
**Matusevich, E.S.,** *See* Romanov, V.M., 9:3966
**Matveev, V.A.,** *See* Krasnikov, N.V., 9:3764
**Matzie, R.A.,** Benefits of extended burnup cycles at Arkansas Nuclear One-2, 9:2235 (J;US)
**Maudlin, P.J.,** *See* Cacuci, D.G., 9:2472
**Maurel, A.,** Solar desalination, 9:2140 (R;FR)
**Maverick, A.W.,** Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2947 (J;US)
**Maximilien, R.,** Radiotherapy of acne - a literature survey, 9:3355 (R;FR;In French)

**Maxwell, W.A.,** *See* Griess, J.C., 9:2749
**May, A.,** Evaluation of radium and toxic element leaching characteristics of Florida phosphogypsum stockpiles. Report of investigations/1983, 9:3289 (R;US)
**May, E.K.,** Determination of freeze-protection heat loss from a parabolic trough solar system, 9:2150 (R;US)
**Maya, I.,** *See* Hopkins, G.R., 9:4217
**Mayberry, J.L.,** The certification program of transuranic wastes at INEL, 9:2038 (J;US)
**Mayer, J.W.,** *See* Galvin, G.J., 9:2874
**Mayne, C.L.,** *See* Pugmire, R.J., 9:1787
**Mays, C.W.,** *See* Lloyd, R.D., 9:3404
**Mazhari, F.,** *See* Delaunay, M., 9:4231
**Maziasz, P.J.,** MC precipitate characterization in austenitic stainless steel, 9:2769 (BA;US)
**Maziere, M.,** *See* Berget, G., 9:3356
**Mazumdar, S.,** Electron-electron interactions and broken symmetry in one dimension, 9:3541 (R;US)
**McBee, W.C.,** *See* Jong, B.W., 9:1802
**Mcbride, M.A.,** *See* Jones, E.D., 9:2727
**McCabe, W.J.,** Falls Dam, Otago, sedimentation rate measured by the caesium-137 profile, 9:3435 (R;NZ)
Radioactive tracers in geothermal underground water flow studies, 9:2158 (R;NZ)
**McCallum, J.D.,** *See* Elam, W.T., 9:2946, 9:2970
**McCardell, R.K.,** Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2516 (BA;FI)
**McCaslin, J.B.,** *See* Smith, A.R., 9:3885
**McCaughan, L.,** *See* Feit, M.D., 9:4026
**McClain, F.W.,** *See* Hsu, J.Y., 9:4088
**McClelland, L.,** Tenant-paid energy costs in multifamily rental housing: effects on energy use, owner investment, and the market value of energy, 9:2609 (R;US)
**McClure, J.D.,** *See* Jefferson, R.M., 9:1944
**McClure, J.W.,** *See* Koopman, R.P., 9:1885
**McComas, D.J.,** *See* Bame, S.J., 9:3506
**McConnell, R.P.,** Laser annealing of Ni(001), 9:2719 (J;US)
**McCormick, T.R.,** *See* Dastur, A.R., 9:2263
**McCoy, D.F.,** *See* Merriman, F.C., 9:2286
**McCulla, W.H.,** *See* Bostick, W.D., 9:3279
**McCulloch, W.H.,** Research on equipment survival in a hydrogen burn, 9:2459 (R;US)
**McDaniels, D.K.,** *See* Tinsley, J.R., 9:3933
**McDonald, J.A.,** *See* Richards, L.W., 9:3272
**McDougal, L.K.,** *See* Orrison, L.H., 9:3386
**McDowell, H.K.,** Theoretical studies of surface diffusion: Self-diffusion in the fcc(100) system, 9:2732 (J;US)
**McDowell, M.S.,** A convenient route to superoxide ion in aqueous solution, 9:3027 (J;US)
**McEachern, D.W.,** *See* Turner, R.F., 9:2320
**McElroy, J.L.,** *See* Burkholder, H.C., 9:2018
*See* Crandall, J., 9:1948
**McElroy, R.D.,** *See* Clark, D.D., 9:3905
**McFarlane, W.K.,** CP-violating polarization in K/sub $\mu 3/^+$ and K/sub $\mu 3/^0$ decays, 9:3686 (RA;US)
**McGahan, L.J.,** *See* Vastola, F.J., 9:1778
**McGlaun, J.M.,** *See* Berman, M., 9:2453
**McGlynn, S.P.,** Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3007 (R;US)
*See* Lewis, J.W., 9:3013
**McGowan, J.W.,** *See* Mitchell, J.B.A., 9:3565
**McGuire, K.,** *See* White, R.B., 9:4117
**McHale, E.T.,** Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981, 9:3114 (R;US)
Development and evaluation of coal-water mixture combustion technology. Phase I. Second quarterly report, 11 January 1981-10 April 1981, 9:3115 (R;US)
**Mchugh, J.P.,** *See* Duncan, C.S., 9:2867
**McInturff, A.,** *See* Ishibashi, K., 9:3078
**McKamey, C.G.,** *See* Koch, C.C., 9:2714
**McKay, D.R.,** *See* Liu, D.K., 9:3003
**McKee, B.,** *See* Broad, L., 9:2271
**McKee, C.,** Heliüm approach to leak detection, 9:2195 (J;US)
**McKee, R.A.,** Analysis of the stoichiometry and temperature dependence of cation diffusion in wustite, Fe/sub 1-delta/O, 9:2784 (J;US)
**McKee, R.G.,** *See* Rempel, J.R., 9:3070
**McKee, R.G. Jr.,** Blast/fire interaction experiments, 9:3251 (RA;US)
**McKenna, H.E.,** *See* Kelley, N.D., 9:2186
**McKeon, D.,** Cesium-137 gamma-source considerations for dry-sludge irradiators, 9:2072 (R;US)
**McKeough, P.,** *See* Solantausta, Y., 9:1781
**McKeown, R.,** *See* Boehm, F., 9:3710
**McKinley, J.M.,** Criteria for grasar action in astrophysical sources, 9:3471 (R;US)
**McKinley, K.B.,** *See* Mayberry, J.L., 9:2038
**McLarnon, F.R.,** *See* Nichols, J.T., 9:2526
**McLatchy, M.J.,** *See* Childs, F.W., 9:2180
**McLaughlin, M.,** Inclusive production of direct photons in 200-GeV/c collisions, 9:3725 (J;US)
**McLean, D.R.,** Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles, 9:1911 (RA;CA)
**McLean, E.A.,** Observation of magnetic fields in laser-produced plasma using the Zeeman effect, 9:4190 (R;US)
*See* Herbst, M.J., 9:4191
**McLean, W.,** Chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films, 9:2790 (J;US)
**McMain, A.,** *See* Rao, R., 9:1908
**McMasters, O.D.,** *See* Stassis, C., 9:2742
**McMasters, R.,** *See* Melendres, C.A., 9:2939
**McMullen, J.C.,** *See* Carpenter, J.H., 9:2006
**McMurray, R.E. Jr.,** *See* Haller, E.E., 9:2851
**McRae, T.G.,** BAGI: a new concept for the detection and tracking of hazardous gases, 9:1887 (R;US)
*See* Bingham, G.E., 9:2906
*See* Koopman, R.P., 9:1885
**McTague, J.P.,** *See* Allen, M.P., 9:3993
**McWilliams, B.M.,** Wafer-scale laser pantography: Fabrication of n-metal-oxide-semiconductor transistors and small-scale integrated circuits by direct-write laser-induced pyrolytic reactions, 9:3109 (J;US)
**Meaettae, J.,** *See* Kohonen, R., 9:2634
**Meagher, A.,** *See* Pan, H.K., 9:2979
**Mearns, A.J.,** *See* Rau, G.H., 9:3328
**Mebel', M.V.,** *See* Il'inov, A.S., 9:3937
**Mecklenburg, W.,** Surface terms and dual formulations of gauge theories, 9:3832 (R;XA)
**Medecki, H.,** Streak cameras for soft x-ray and optical radiation, 9:4084 (R;US)
**Meek, C.C.,** Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2406 (R;US)
**Mehta, K.K.,** *See* Dormuth, K.W., 9:1977
**Meier, C.A.,** *See* Hickman, R.G., 9:3232
**Meisel, D.,** *See* Thurnauer, M.C., 9:3020
**Meisel, M.W.,** *See* Roach, P.R., 9:3608
**Mel'nichenko, I.A.,** *See* Aleshin, Yu.D., 9:3633
**Melendres, C.A.,** In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2939 (J;US)
**Meline, F.G.,** Demister apparatus for gaseous wastes carrying radioactive aerosols, 9:1958 (RA;XA;In French)
**Melkumov, G.L.,** *See* Arkhipov, V.V., 9:3638
**Mellinger, G.B.,** *See* Oma, K.H., 9:2002
**Melo, A.A.,** *See* Soares, J.C., 9:3926
**Melo, C.P. de,** *See* Kirtman, B., 9:2695
**Melson, G.A.,** *See* Crawford, J.E., 9:2924
**Melton, J.D.,** *See* Espenson, J.H., 9:2985
**Melville, J.G.,** *See* Molz, F.J., 9:2522
**Men'shikov, L.I.,** *See* Bakalov, D.D., 9:3639
**Meneley, D.A.,** Reactor safety. Some current realities, 9:2429 (RA;CA)
**Menet, J.,** *See* Cassagnou, Y., 9:3875
**Meng, R.L.,** *See* Huang, S.Z., 9:2764
**Mengoni, A.,** *See* Matthews, G.J., 9:3485
**Menikoff, R.,** Rayleigh—Taylor instability and the use of conformal maps for ideal fluid flow, 9:3613 (J;US)
**Menlove, H.O.,** Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2062 (BA;XA)
**Mensinger, J.D.,** *See* Fannin, K.F., 9:2085
**Menteshashvili, Z.R.,** *See* Garsevanishvili, V.R., 9:3949
**Mercado, F.,** *See* Oliver, A., 9:3095
**Mercer, J.C.,** Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1888 (R;US)
**Mercer, R.L.,** *See* Clark, B.C., 9:3895
**Mercier, C.,** Magnetic islands and turbulence, 9:4056 (R;FR;In French)
*See* Cano, R., 9:4055
**Mercier, G.,** *See* Duval, J., 9:1843
**Merer, A.J.,** *See* Carrick, P.G., 9:3582
**Merlos, H.,** *See* Araya, J.A., 9:2704
**Merrill, R.D.,** EE/NESD computer-aided engineering FY '84 plan, 9:4251 (R;US)
**Merriman, F.C.,** Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program), 9:2286 (R;US)
**Merritt, B.T.,** *See* Whitham, K., 9:4195

**Merry, R.D.,** *See* Dietz, C.F., 9:1896
**Mertens, E.,** *See* Baars, H.G., 9:3362
**Merzagora, N.,** Analysis of medium-term economic development and energy consumptions through the EURECA-EXPLOR-EDM model chain. Final report, 9:2596 (R;XE)
**Messenger, R.,** Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report, 9:2624 (R;US)
**Messier, R.,** *See* Ross, R.C., 9:2850
**Messina, R.,** *See* Buvet, R., 9:2966
**Mestayer, M.D.,** *See* Alam, M.S., 9:3719
**Meszaros, T.,** CT examination of the hip, 9:3363 (RA;HU;In Hungarian, English)
**Meyer, P.J.,** Auxiliary systems, 9:2226 (R;DE)
Cooling systems, emergency cooling, recooling, 9:2418 (R;DE)
PWR and BWR safety systems layout, 9:2419 (R;DE)
Safety systems of heavy water reactors and small power reactors, 9:2211 (R;DE)
**Meyer, R.,** *See* Leutwyler, S., 9:3556
**Meyer, R.E.,** Batch method of measuring sorption ratios, 9:3293 (R;US)
Control of redox conditions during sorption measurements, 9:2913 (R;US)
**Meyer, R.L.,** *See* Fidone, I., 9:4087
**Meyer, T.,** *See* Schaefer, G.F., 9:2142
**Mezoe, T.,** *See* Treer, T., 9:3371
**Michalopoulos, D.L.,** *See* Powers, D.E., 9:3588
**Michel, J.,** *See* Love, P.E., 9:4241
**Micklich, B.J.,** *See* Kulsrud, R.M., 9:4134
**Middleditch, J.,** *See* Jensen, K.A., 9:3487
**Middleton, H.R.,** *See* Watson, A.E., 9:2899
**Midgett, M.R.,** *See* Streib, E.W., 9:3281
**Midzuno, Yukio,** *See* Murakami, Akihiko, 9:4071
**Mielke, E.W.,** Eight-fold way to colour geometrodynamics, 9:3797 (R;XA)
**Mignerey, A.C.,** *See* Breuer, H., 9:3897
**Mikselian, K.O.,** Time evolution of density perturbations in accelerating stratified fluids, 9:3610 (J;US)
**Mikha i, Z.,** *See* Krumshtejn, Z.V., 9:3185
**Mikhajlichenko, V.I.,** *See* Aleshin, Yu.D., 9:3633
**Mikhalake, D.,** *See* Adam, G., 9:2829
**Miki, K.,** *See* Aoyama, M., 9:2214
**Milam, D.,** Influence of deposition parameters on laser-damage threshold of silica-tantala AR coatings, 9:2795 (J;US)
*See* Rainer, F., 9:2747
**Miley, G.H.,** Advanced fuel concepts and applications, 9:4218 (BA;XA)
**Miliaras, E.S.,** Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach, 9:2190 (R;US)
**Millener, D.J.,** *See* Auerbach, E.H., 9:3793
**Miller, B.M.,** *See* Sullivan, M.F., 9:3402, 9:3403
**Miller, C.M.,** *See* Nogar, N.S., 9:3194
**Miller, C.W.,** Examination of the environmental half-time for radionuclides deposited on vegetation, 9:3305 (J;GB)
**Miller, D.J.,** Low-energy $K^- p$ interactions, 9:3677 (RA;US)
**Miller, D.L.,** GaAs peeled-film solar cells. Final report, March 15, 1980-December 31, 1981, 9:2129 (R;US)
**Miller, G.,** *See* Leitner, P., 9:3273
**Miller, H.C.,** Thermal diffusivities of molybdenum/alumina cermets, 9:2800 (J;US)
**Miller, J.C.,** Kinetics of the Cl—$H_2$ system. II. Abstraction vs exchange in D+HCl, 9:2955 (J;US)
**Miller, J.R.,** *See* Huddleston, R.K., 9:3034
**Miller, L.G.,** *See* Deis, G.A., 9:4158
**Miller, R.J.,** *See* Ozdemir, L., 9:1907
**Miller, R.L.,** Modular stellarator reactor: a fusion power plant, 9:4184 (R;US)
*See* Link, B.W., 9:2394
**Miller, S.C.,** Tissue, cellular, and subcellular distribution of $^{241}Pu$ in the rat testes, 9:3401 (J;US)
**Miller, W.H.,** Quantum mechanical rate constants for bimolecular reactions, 9:2920 (J;US)
Reaction-path dynamics for polyatomic systems, 9:3563 (J;US)
*See* Schwartz, S.D., 9:3559
**Mills, G.D.,** *See* Fischer, S.M., 9:3428
**Mills, R.L.,** Phase diagram and transition properties of condensed ammonia to 10 kbar, 9:2091 (J;US)
**Mills, W.J.,** Fracture-mechanics behavior of neutron-irradiated Alloy A-286, 9:2691 (R;US)
**Milonni, P.W.,** *See* Ackerhalt, J.R., 9:3562
*See* Galbraith, H.W., 9:3550
**Milora, S.L.,** Development of hydrogen pellet injectors and pellet fuelling experiments at Oak Ridge National Laboratory, 9:4230 (BA;XA)
*See* Schuresko, D.D., 9:4152
**Milroy, R.D.,** *See* Hoffman, A.L., 9:4086
**Minemura, H.,** *See* Wands, R., 9:3079
**Miner, F.J.,** Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982, 9:1936 (R;US)
**Mings, W.J.,** Catalytic distillation: a government-industry success story, 9:2649 (R;US)
**Miramand, P.,** *See* Masson, M., 9:3292
**Mischke, R.E.,** *See* Goldman, T., 9:3679, 9:3691, 9:3697
**Misemer, D.K.,** *See* Peterman, D.J., 9:2791
**Mishima, Kaichiro,** Flow test for the full scale core mockup of the KUHFR, (1). Velocity distribution and pressure loss in the core, 9:2391 (R;JP;In Japanese)
**Mishra, V.K.,** Effective mass and the specific heat of normal liquid $^3He$, 9:3607 (J;US)
**Misiewicz, R.,** Core subchannel thermal-hydraulic analysis methods and critical heat-flux margin in a light-water breeder reactor, 9:2287 (R;US)
**Mitchell, A.C.,** *See* Holmes, N.C., 9:3545
**Mitchell, J.B.A.,** Measurement of the branching ratio for the dissociative recombination of $H_3^+ + e$, 9:3565 (J;US)
**Mitchell, J.T.D.,** *See* Holroyd, R.J., 9:4150
**Mitchell, R.E.,** *See* Mitchell, J.B.A., 9:3565
**Mitchell, T.J.,** *See* Morris, M.D., 9:4248
**Mitlitsky, F.,** *See* McWilliams, B.M., 9:3109
**Mitsch, B.F.,** Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area, 9:3339 (R;US)
**Mitsel'makher, G.V.,** *See* Baranov, V.A., 9:3187
*See* Evtukhovich, P.G., 9:3186
**Mitsonias, C.,** *See* Chrysochoides, N.G., 9:2380
**Mittig, W.,** *See* Alamanos, N., 9:3889
**Miyamoto, A.,** *See* Kawabata, S., 9:3198
**Miyamoto, S.,** *See* Nakai, S., 9:4183
**Miyanaga, Noriaki,** *See* Yamada, Kawakatsu, 9:4061
**Miyano, K.,** Phases of insoluble monolayers: Comparison between the surface pressure-molecular area (Pi-A) diagram and shear modulus measurements, 9:2993 (J;US)
**Mizrachi, L.,** *See* Mecklenburg, W., 9:3832
**Mizukoshi, K.,** *See* Kuroda, T., 9:2433
**Moazed, A.,** *See* Miller, R.L., 9:4184
**Mochan, I.,** Optical properties of quasi-two-dimensional systems, 9:2826 (RA;BR;In Spanish)
**Mochan, W.L.,** Surface contribution to the optical properties of nonlocal systems, 9:3994 (J;US)
**Moebus, M.C.,** *See* Orzechowski, T.J., 9:3158
**Moehlecke, S.,** *See* Ovadyahu, Z., 9:2796
**Moeller, L.,** Literature survey of the composition and of the acute effects of the exhaust gases of Diesel engines, 9:3267 (R;SE;In Swedish)
**Moghissi, A.A.,** *See* Croff, A.G., 9:2037
**Mohammadi, J.,** Effects of multiple bursts on structural response, 9:3065 (RA;US)
*See* Longinow, A., 9:3064, 9:3066, 9:3067
**Mohapatra, R.N.,** Spontaneous breaking of global B-L symmetry and matter-antimatter oscillations in grand unified theories, 9:3804 (R;XA)
**Mohr, C.L.,** LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2449 (R;US)
**Mohri, Akihiro,** Formation of relativistic electron beam rings in a conducting cavity, 9:4074 (R;JP)
**Moinard, M.,** Installation of a submerged storage facility by means of a multi-articulation column, 9:1872 (BA;GB)
**Moinester, M.A.,** *See* Sennhauser, U., 9:3881
**Moir, R.W.,** Feasibility study of a fission suppressed blanket for a tandem mirror hybrid reactor, 9:4216 (BA;XA)
**Mokwa, W.,** Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2917 (R;DE;In German)
**Molander, W.,** Time-dependent study of radiation trapping by time-delayed two-photon absorption, 9:3544 (R;US)
**Molinari, J.,** Waste management and the nuclear fuel cycle, 9:2318 (R;DE)
**Molnar, S. von,** Study of the energy gap in single crystal $SmB_6$, 9:2799 (BA;NL)
**Molz, F.J.,** Aquifer thermal energy storage: a well doublet experiment at increased temperatures, 9:2522 (J;US)

**Moncada, G.,** Oxidation effects on the electric resistance of In and Al in thin layers, 9:2699 (RA;BR;In Spanish)
**Mond, M.,** Stability of equilibria with helical magnetic axis, 9:4089 (J;US)
**Mondt, J.P.,** Plasma effects on Heliac configurations: a preliminary investigation, 9:4077 (R;US)
**Moneti, G.C.,** *See* Chen, A., 9:3736
**Moneyhun, J.H.,** *See* Rubin, I.B., 9:3262
**Monoki, E.,** Application of a dimeric contrast medium (Hexabrix) in angiography, 9:3369 (RA;HU;In Hungarian, English)
**Monserrat, K.,** *See* Chandrasekaran, K., 9:3028
**Montaser, A.,** *See* Houk, R.S., 9:3609
**Montazer, P.M.,** Investigation of fracture permeability around an underground opening in metamorphic rocks, 9:3441 (R;US)
**Monticello, D.A.,** *See* Izzo, R., 9:4120
*See* White, R.B., 9:4117
**Moodenbaugh, A.R.,** Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$, 9:2931 (J;US)
**Mook, H.A.,** Lattice dynamics of the intermediate valence compounds Sm/sub 0.75/Y/sub 0.25/S and TmSe, 9:2877 (BA;NL)
**Moon, R.M.,** *See* Stassis, C., 9:2742
**Moore, C.B.,** *See* Jasinski, J.M., 9:3011
**Moore, D.S.,** Sensitive, non-intrusive point diagnostic for atomic chlorine using coherent anti-Stokes Raman scattering, 9:2973 (J;NL)
*See* Schmidt, S.C., 9:3229
**Moore, F.S.,** *See* Bunch, W.L., 9:2383
**Moore, J.W.,** Experience reprogramming TRAC for the HEP computer, 9:2466 (J;US)
**Moore, R.F.,** *See* Mamourian, M., 9:2327
**Moraga, L.A.,** Electron density in reasonably real metallic surfaces, including interchange and correlation effects, 9:3520 (RA;BR;In Spanish)
Polarizability of a metallic surface, 9:3521 (RA;BR;In Spanish)
**Morales, G.J.,** *See* Dawson, J.M., 9:4139
**Moran-Lopez, J.L.,** *See* Kumar, V., 9:3519
**Moravcsik, M.J.,** *See* Kusno, D., 9:3750
**More, V.,** *See* Alonso, J.R., 9:3135
**Morel, A.,** Lattice gauge theories with Susskind fermions at strong coupling. Analytical method and results, 9:3824 (R;FR)
**Morera, J.P.,** *See* Cano, R., 9:4055
**Morewitz, H.,** *See* Denning, R.S., 9:2496
**Morgan, C.S.,** *See* Lauf, R.J., 9:2810
**Morgan, D.L.,** *See* Koopman, R.P., 9:1885
**Morgan, J.G.,** *See* Harbour, P.J., 9:4044
**Morgan, J.N.,** Fuel designs for light water reactors, 9:2234 (J;US)
**Morgan, K.,** *See* Rayment, R., 9:2616
**Morgan, L.G.,** *See* Allen, M.D., 9:1939
**Moriarty, K.J.M.,** *See* Barkai, D., 9:3850
**Morin, P.,** *See* Duval, J., 9:1843
**Morita, Kenji,** Reflection of low energy light-element ions from solid surfaces, 9:4175 (RA;JP;In Japanese)
**Moriyama, A.,** *See* Fujiwara, K., 9:2240
**Morosin, B.,** *See* Fritz, I.J., 9:2879
**Morris, C.L.,** *See* Bhatia, T.S., 9:3152
*See* Bland, L.C., 9:3878
*See* Seestrom-Morris, S.J., 9:3888
*See* Ullmann, J.L., 9:3917
**Morris, E.E.,** A comparison study of Response Surface Methodology and Differential Sensitivity Theory in core disruptive accident analysis, 9:2491 (BA;US)
**Morris, M.D.,** Two-level compromise designs for estimating main effects and detecting interactions, 9:4248 (R;US)
**Morris, R.W.,** *See* Brannon, P.J., 9:2833
**Morris, W.,** *See* Jenkins, C.M., 9:3727
**Morse, M.D.,** Spectroscopic studies of the jet-cooled copper trimer, 9:3547 (J;US)
**Morse, R.L.,** Applications of hybrid numerical-simulation methods to magnetic-confinement systems, 9:4052 (R;US)
**Morse, W.M.,** *See* Black, J.K., 9:3168
*See* Larsen, R.C., 9:3616
**Mostrom, M.A.,** *See* Jones, M.E., 9:4109
**Moszkowski, S.A.,** *See* Boguta, J., 9:3959
**Motohashi, Haruhiko,** Layer structures of oxide scales on zircaloy-4 tube exposed to steam-hydrogen mixture at high temperatures, 9:2339 (R;JP;In Japanese)
**Mourier, G.,** Apparatus for isotopic separation using a high-frequency wave and coherent radiation, 9:1923 (TG;US)
**Mouthia-Khadija,** Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3393 (R;FR;In French)
**Movchan, S.A.,** *See* Abdushukurov, D.A., 9:3191
**Moynihan, C.T.,** *See* Ingram, M.D., 9:2885
**Mozer, F.S.,** Comparison of spherical double probe electric field measurements with plasma bulk flows in plasmas having densities less than 1 $cm^{-3}$, 9:3510 (J;US)
**Mroz, E.J.,** Stratospheric sulfate from El Chichon and the Mystery Volcano, 9:3275 (J;US)
**Mueller, C.J.,** *See* Morris, E.E., 9:2491
**Mueller, H.,** *See* D'Agostini, G., 9:3625
**Mueller, W.,** Three Mile Island 2. The accident of March 28, 1979, as seen from the point of view of radiation protection experts, 9:2434 (R;DE;In German)
**Muetterties, E.L.,** *See* Burch, R.R., 9:2988
*See* Tsai, M.C., 9:2967
**Mugneret, J.,** *See* Vedrenne, J.P., 9:1899
**Muhlestein, L.D.,** Summary of HEDL Fusion Reactor Safety Support studies, 9:4166 (RA;XA)
**Muhr, G.,** *See* Wieczorek, H., 9:1951
**Muirhead, V.U.,** An investigation of the internal and external aerodynamics of cattle trucks. Final Report, 9:2638 (R;US)
**Mukamel, D.,** Breakdown of maximality conjecture in continuous phase transitions, 9:4022 (R;IL)
**Mukunda, N.,** Fourier optics for the Maxwell field: formalism and applications, 9:4003 (R;US)
*See* Simon, R., 9:4004
*See* Sudarshan, E.C.G., 9:4005
**Mul, P.M.,** *See* Mitchell, J.B.A., 9:3565
**Mulas, Eh.,** Simple method of energy and emission angle determination of protons registeres in heavy liquid bubble chambers, 9:3189 (R;SU;In Russian)
**Mulay, L.N.,** Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2076 (R;US)
**Muller, C.H. III,** *See* West, W.P., 9:3046
**Muller, J.C,** Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2106 (R;FR;In French)
**Mullins, O.C.,** Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2981 (J;US)
**Mumford, J.,** Sample collection and preparation methods affecting mutagenicity and cytotoxicity of coal fly ash, 9:3418 (R;US)
**Mundis, J.,** *See* McKee, C., 9:2195
**Murakami, Akihiko,** Analysis of current drive by travelling wave based on theory of intrinsic stochasticity, 9:4071 (R;JP)
**Murakami, H.,** *See* Kuroda, T., 9:2433
**Muralidharan, S.,** Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2926 (J;US)
**Murao, Yoshio,** *See* Okubo, Tsutomu, 9:2440
**Murata, T.,** *See* Nagaki, H., 9:2029
**Murav'ev, E.V.,** *See* Lipov, M.Yu., 9:4162
**Murphy, C.E. Jr.,** Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models, 9:3265 (R;US)
**Murphy, J.H.,** *See* Miller, R.L., 9:4184
**Murphy, J.L.,** *See* Mara, G.L., 9:2713
**Murphy, M.J.,** Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3896 (J;US)
**Murr, L.E.,** A form of Hall-Petch law for the strength of glassy metals, 9:2770 (J;DD)
*See* Staudhammer, K.P., 9:2735
**Mursula, K.,** *See* Halzen, F., 9:3787
**Murtagh, M.J.,** *See* Baker, N.J., 9:3731
**Murthy, K.,** *See* Chu, T.L., 9:2871
**Musho, M.K.,** *See* Kozak, J.J., 9:3995
**Mutka, H.,** Irradiation of layered metallic dichalcogenides: disorder in the charge density waves, 9:2821 (R;FR;In French)
**Muylle, E.P.,** Harmonization of methods for measurements of $SO_2$. Final report, 9:3270 (R;US)
**Myrick, T.E.,** Determination of concentrations of selected radionuclides in surface soil in the US, 9:3303 (J;GB)
**Myuller-Preusker, M.,** *See* Ilgenfritz, E.M., 9:4013

## N

**Nagai, Shiro,** Desorption by ions and electrons, 9:4176 (RA;JP;In Japanese)
**Nagai, T.,** Development of substorm activity in multiple-onset substorms at synchronous orbit, 9:3505 (J;US)
**Nagaki, H.,** Development of CT techniques for integrity evaluation of vitrified solids, 9:2029 (J;US)

**Nagase, F.,** *See* Kawai, N., 9:3453
**Nagy, J.F.,** *See* Thomson, S.J., 9:1806
**Nainiger, J.J.,** *See* Stochl, R.J., 9:2193
**Nair, V.P.,** Catalysis of flavor nonconservation by monopoles, 9:3790 (J;US)
**Najdenkova, T.I.,** *See* Bocharova, I.E., 9:2324
**Najdzioneck, J.S.,** *See* Maverick, A.W., 9:2947
**Nakagome, Y.,** *See* Kanda, K., 9:2355
**Nakai, S.,** Enhancement of energy deposition of intense electron beam on low Z targets, 9:4183 (RA;JP)
**Nakai, Yohta,** *See* Yamaguchi, Sadae, 9:3968
**Nakamura, Tomoo,** *See* Tanaka, Shun-ichi, 9:3969
**Nakamura, Y.,** *See* Nagaki, H., 9:2029
**Nakasima, R.,** *See* Tasaka, K., 9:3915
**Nakayama, K.,** Energetics of the Gamow-Teller resonances, 9:3947 (R;BR)
*See* Tanaka, M., 9:3060
**Nandi, S.,** *See* Dicus, D.A., 9:3722
**Nanes, R.,** *See* Holtermann, D.L., 9:3012
**Napadensky, H.,** Air gun test facility, 9:3241 (RA;US)
**Napandensky, H.S.,** *See* Mohammadi, J., 9:3065
**Napier, B.A.,** *See* Oma, K.H., 9:2002
**Napier, G.A.,** *See* FitzPatrick, V.F., 9:2004
**Nara, Yoshihiko,** *See* Ishikawa, Makoto, 9:2395
**Narayan, J.,** Laser processing of semiconductors, 9:2880 (J;US)
Melting and laser annealing in semiconductors using 0.485 μm and 0.193 μm pulsed lasers, 9:2878 (BA;NL)
Melting phenomenon and properties of defects associated with pulsed laser irradiation, 9:2882 (J;GB)
Rapid thermal annealing of arsenic and boron-implanted silicon, 9:2840 (J;US)
**Nard, G.,** Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system), 9:1830 (BA;GB)
**Narihar.., Kazumichi,** Evolution of ring current formed by relativistic electron beam injection into a charge but not current neutralizing plasma, 9:4072 (R;JP)
*See* Mohri, Akihiro, 9:4074
**Narison, S.,** *See* Craigie, N.S., 9:3747
**Narita, Tsutomu,** *See* Hasegawa, Akira, 9:3952
**Naroska, B.,** Recent results from Jade on electroweak interactions, 9:3627 (R;DE)
**Narten, A.H.,** Hydration of the $Nd^{3+}$ ion in neodymium chloride solutions determined by neutron diffraction, 9:2940 (J;US)
**Nason, P.,** *See* Pizzini, S., 9:2137
**Nassopoulos, G.P.,** *See* Wells, P.B., 9:2152
**Natale, A.A.,** Gauge hierarchy problem, 9:3833 (R;BR)
**Naughton, M.D.,** *See* Dam, A.S., 9:2010
**Nauman, R.V.,** *See* Lewis, J.W., 9:3013
**Nave, S.E.,** Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2787 (J;US)
**Navratil, G.A.,** *See* Machida, M., 9:4124
**Nazare, S.,** *See* Hrovat, M.F., 9:2361
**Nazaryan, A.E.,** *See* Eremyan, Sh.S., 9:3743, 9:3744
**Ne'eman, Y.,** Prospects for further unification, 9:3827 (R;US)
**Negele, J.W.,** *See* Balantekin, A.B., 9:3882
**Neklyudov, I.M.,** *See* Gann, V.V., 9:2548
**Nellis, W.J.,** *See* Holmes, N.C., 9:3545
**Nelson, G.C.,** Status report on the ASTM E-42 Committee on Surface Analysis, 9:2904 (R;US)
**Nelson, L.S.,** Reply to the comments by M.D. Allen and L.G. Morgan, 9:1940 (J;US)
**Nelson, M.E.,** *See* Lockyer, N.S., 9:3716
**Nelson, O.A.,** Clarity in writing and editing, 9:4239 (R;US)
**Nemet, J.,** *See* Hick, H., 9:3100
**Nemeth, G.,** *See* Hermann, A., 9:3379
**Nern, C.F.,** Regional compacting for low-level radioactive waste management: an innovative approach, 9:2009 (J;US)
**Nesbit, W.,** Particlulates: caught at the filter line, 9:2196 (J;US)
**Nesterenko, V.O.,** *See* Solov'ev, V.G., 9:3923
**Nesterenko, V.U.,** *See* Karpeshin, F.F., 9:3936
**Nestor, C.W. Jr.,** *See* Crawford, O.H., 9:3973
**Neta, P.,** *See* Brault, D., 9:3037
**Neto, J.L.,** Path integral theory and deep inelastic scattering of nuclei, 9:3963 (B;GB)
**Netushil, T.,** *See* Abdushukurov, D.A., 9:3191
**Netzel, T.L.,** *See* Bergkamp, M.A., 9:2925
**Neuffer, D.,** Muon storage ring for LAMPF II, 9:3167 (RA;US)
**Neumeyer, C.,** *See* Schwarz, U., 9:4234
**Newbold, J.D.,** Nutrient spiralling in streams: implications for nutrient limitation and invertebrate activity, 9:3330 (J;US)
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3341 (J;US)
**Newcomb, W.A.,** Compressibility effect on instability growth rates, 9:3606 (J;US)
**Newkirk, L.R.,** Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2812 (BA;US)
**Newman, E.,** Availability of enriched isotopic material for accelerator targets, 9:2068 (J;US)
**Newman, L.W.,** Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2223 (R;US)
**Newman, P.,** Evaluation of the water gun as a marine seismic source, 9:3440 (BA;GB)
**Newman, W.H.,** Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2283 (R;FR;In French)
**Newton, D.G.,** Fabrication of highly-loaded low-enrichment uranium aluminide fuel plates, 9:2336 (RA;US)
**Newton, M.D.,** Ab initio calculation of interatomic force constants in $H_6Si_2O_7$ and the bulk modulus of α quartz and α cristobalite, 9:2886 (J;DE)
*See* Logan, J., 9:2957
**Nexsen, W.E.,** *See* Turner, W.C., 9:4198
**Neylan, A.J.,** *See* Turner, R.F., 9:2320
**Ng, C.T.,** *See* Mitchell, J.B.A., 9:3565
**Ng, Y.C.,** Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1827 (R;US)
**Nguyen, H.,** Maximizing steam-drive recovery in light-oil systems. Final report, 9:1825 (R;US)
**Nguyen, K.,** Role of the hot-electron distribution function in the stability of the ELMO Bumpy Torus, 9:4114 (J;US)
**Nguyen Van Giai,** Nuclear excitations in the nuclear response theory, 9:3951 (R;FR)
**Nichols, J.T.,** Rechargeability of the zinc electrode in alkaline electrolyte, 9:2526 (R;US)
**Nicholson, D.R.,** *See* Hansen, P.J., 9:4108
**Nicholson, W.,** *See* Denning, D., 9:4263
**Nickel, G.H.,** Angle-averaged Compton cross sections, 9:3542 (R;US)
**Nickols, J.W.,** *See* Okinaka, R.T., 9:3417
**Nicolescu, B.,** New ISR and collider anti p-p and p-p data and asymptotic theorems, 9:3632 (R;FR)
**Nieminen, M.,** Properties of indigenous fuels. Part 1. Effect of thermal drying on the structure of sod peat, 9:1814 (R;FI;In Finnish)
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples, 9:2099 (R;FI;In Finnish)
**Nieves, A.L.,** *See* Rothchild, J., 9:2630
**Nigg, D.W.,** One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program, 9:2412 (R;US)
**Nikitin, S.Ya.,** *See* Aleshin, Yu.D., 9:3633
**Nikolic, V.,** Short description of the research project 'building and energy', 9:2605 (RA;DE;In German)
**Nishihara, K.,** *See* Nakai, S., 9:4183
**Nishikawa, M.,** Electron attachment to oxygen in supercritical hydrocarbon fluids, 9:2982 (J;US)
**Niu, Keishiro,** *See* Yamaguchi, Seiya, 9:4170
**Nix, J.R.,** *See* Davies, K.T.R., 9:3957
**Nobel, P.S.,** Low temperature tolerance and cold hardening of cacti, 9:3388 (J;US)
**Nocera, D.G.,** *See* Maverick, A.W., 9:2947
**Noda, Kenji,** *See* Ohno, Hideo, 9:2828
**Noda, N.,** Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4070 (R;JP)
*See* Ohkubo, K., 9:4064
**Nogar, N.S.,** Resonance ionization mass spectrometry at Los Alamos National Laboratory, 9:3194 (R;US)
**Noid, D.W.,** Comparison of quantal, classical, and semiclassical behavior at an isolated avoided crossing, 9:3585 (J;US)
*See* Stine, J.R., 9:3581
**Nolfi, F.V. Jr.,** Chemical potentials in solids, 9:3999 (J;US)
**Nordberg, G.,** *See* Lagerkvist, B., 9:3413
**Nordell, B.,** *See* Andersson, S., 9:2518
**Nordstroem, S.,** Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review, 9:3414 (R;SE;In Swedish)
*See* Leffler, P., 9:3412

**Noring, J.E.**, High temperature solar-thermochemical processing-hydrogen and sulfur from hydrogen sulfide, 9:2135 (J;GB)
**Norment, H.G.**, DNAF-1: an analytical fallout prediction model and code. Final report 12 Mar 80-31 Oct 81, 9:3231 (R;US)
**Norris, J.R.**, *See* Tang, J., 9:2818
**Novakov, T.**, *See* Oblath, S.B., 9:2965
**Novikov, A.G.**, *See* Glazkov, Yu.Yu., 9:3173
**Novikov, I.D.**, *See* Kardashev, N.S., 9:3472
**Numbere, D.T.**, *See* Nguyen, H., 9:1825
**Nunogaki, Masanobu**, Blistering due to neutral He particle bombardment in refractory metals, 9:4181 (RA;JP;In Japanese)
**Nunz, G.J.**, Probabilistic planning and budgeting for R & D programs involving activities of high uncertainty, 9:4242 (R;US)
**Nussenzveig, H.M.**, *See* Hussein, M.S., 9:3948
**Nussinov, S.**, *See* Gelmini, G.B., 9:3810
**Nyffeler, U.P.**, *See* Santschi, P.H., 9:3340
**Nygaard, K.J.**, *See* Cornell, M.C., 9:2869

## O

**O'Brien, D.W.**, Engineering work stations in the national laboratory, 9:4253 (R;US)
**O'Brien, H.A.**, *See* Wilbur, D.S., 9:3048
**O'Brien, M.H.**, Digitally controlled measurement of sonic elastic moduli and internal friction by phase analysis, 9:3219 (J;US)
**O'Connell, R.F.**, *See* Khandker, A., 9:4128
**O'Hagan, J.B.**, *See* Brainard, J.P., 9:3557
**O'Hara, J.C.**, Radiation protection technology transfer for overseas nuclear power stations, 9:2474 (J;US)
**O'Keeffe, N.O.**, *See* Newton, M.D., 9:2886
**O'Neal, W.C.**, *See* Gregg, D.W., 9:2005
**O'Neill, R.**, Structure and trends in natural gas wellhead contracts, 9:1882 (R;US)
**O'Neill, R.V.**, *See* Gardner, R.H., 9:3349
*See* Newbold, J.D., 9:3330, 9:3341
**Obenschain, S.P.**, *See* Herbst, M.J., 9:4191
**Oberacker, V.E.**, Study of fission dynamics by muon-induced fission, 9:3938 (RA;US)
**Oberti, A.**, *See* Pizzini, S., 9:2137
**Oblad, H.B.**, Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1786 (D;US)
**Oblath, S.B.**, Reaction of nitrite ion with hydroxylamine-N-sulfonate in aqueous solution, 9:2965 (J;US)
**Oda, Toshiatsu**, *See* Furukane, Utaro, 9:4063
**Odintsov, V.N.**, *See* Gusev, S.V., 9:4188
**Oertel, G.K.**, Policy directions: Department of Energy transuranic waste management programs, 9:2033 (J;US)
**Oganesyan, Yu.Ts.**, Cyclotron facility for acceleration of heavy ions to 20-120 MeV/nucleon, 9:3126 (R;SU;In Russian)
**Ogasawara, Masatada**, *See* Ichiba, Hideo, 9:4067
**Ogawa, I.**, *See* Ohkubo, K., 9:4064
**Ogawa, K.**, *See* Kawabata, S., 9:3198
**Ogeltree, J.**, *See* Datta, R., 9:2133
**Oh, Y.K.**, *See* Chung, M.K., 9:4182
**Ohkubo, K.**, Electron cyclotron heating of stellarator plasma with the ordinary and the extraordinary modes in JIPP T-II, 9:4064 (R;JP)
*See* Noda, N., 9:4070
**Ohnishi, Masami**, *See* Okamoto, Masao, 9:4069
**Ohno, Hideo**, Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2828 (R;JP;In Japanese)
**Ohnuki, Akira**, *See* Adachi, Hiromichi, 9:2438
**Ohtani, Shunsuke**, *See* Matsumoto, Atsushi, 9:4073
**Ole, T.**, Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2972 (J;US)
**Oka, T.**, *See* Goldman, T., 9:3697
**Okada, Touichi**, *See* Nunogaki, Masanobu, 9:4181
**Okamoto, Masao**, Possible method for burn control by compression-decompression, 9:4069 (R;JP)
**Okamoto, P.R.**, *See* Averback, R.S., 9:2725
**Okhrimenko, L.S.**, *See* Mulas, Eh., 9:3189
**Okinaka, R.T.**, Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3417 (R;US)
**Okubo, Tsutomu**, Improvement of core mass balance calculation in REFLA-1D/MODE1, 9:2440 (R;JP)
**Olden, L.R.**, Application of conventional building technology in the storage of low level solid reactor wastes, 9:1979 (RA;CA)
**Oldfield, E.**, *See* Keniry, M.A., 9:3353
**Oldham, D.W.**, *See* Dietz, C.F., 9:1896
**Oliensis, J.**, *See* Fischler, M., 9:3784
**Oliveira, F.A.**, Time reversal theory in light scattering, 9:4010 (RA;BR;In Portuguese)
**Oliveira, M.J. de**, *See* Curado, E.M.F., 9:3525
**Oliver, A.**, Analysis of the Al-Ag thin film system by Rutherford Backscattering Spectroscopy (RBS) and Auger Electron Spectroscopy (AES), 9:2701 (RA;BR;In Spanish)
System for surface multiple analysis in the IFUNAM (Mexico), 9:3095 (RA;BR;In Spanish)
**Olmscheid, B.A.**, *See* Carpenter, J.H., 9:2006
**Olofsson, B.**, *See* Estborn, L., 9:3411
**Olsen, D.K.**, *See* Coceva, C., 9:3162
**Olsen, R.B.**, Pyroelectric energy conversion: Hysteresis loss and temperature sensitivity of a ferroelectric material, 9:2593 (J;US)
**Olsen, R.S.**, Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations, 9:3291 (R;US)
**Olsen, T.**, Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2079 (R;NO;In Norwegian)
*See* Soma, M., 9:2095
**Olson, D.L.**, Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3883 (J;US)
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2680 (R;US)
**Olson, H.P.**, *See* Crawford, T.V., 9:2407
**Olson, J.M.**, A fluorescent aminolipid from a green photosynthetic bacterium, 9:3352 (J;US)
**Olson, N.C.**, Shield integrity examinations at the NWCF, 9:2054 (RA;CA)
**Olson, R.E.**, *See* Rille, E., 9:3599
**Olson, R.J.**, *See* Rau, G.H., 9:3328
**Olson, W.P.**, Sources of surface magnetic field variability. Final report, 9:3498 (R;US)
**Olsson, B.**, Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks, 9:2549 (R;SE;In Swedish)
**Olsson, M.G.**, Comment on "quark confinement and the Dirac equation", 9:3847 (J;US)
**Oma, K.H.**, In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:2002 (R;US)
*See* FitzPatrick, V.F., 9:2004
**Ombret, R.**, *See* Falcimaigne, J., 9:1837
**Onderka, G.**, Theoretical and experimental investigations on dust separation in assemblies of perforated metal sheets, 9:3111 (R;DE;In German)
**Ondracek, G.**, *See* Hrovat, M.F., 9:2361
**Ondrechen, M.J.**, Generalized Carnot cycle: A working fluid operating in finite time between finite heat sources and sinks, 9:3124 (J;US)
**Onishi, Nobuaki**, *See* Hoshi, Tatsuo, 9:2389
**Ono, M.**, *See* Wong, K.L., 9:4116
**Oostens, J.**, *See* Gibson, B.F., 9:3665
**Opalka, K.O.**, *See* Mark, A., 9:3255
**Oram, C.J.**, *See* Carr, J., 9:3735
**Ormes, J.F.**, Implications of HEAO-3 data for the acceleration and propagation of galactic cosmic rays, 9:3461 (R;US)
**Ormsbee, A.I.**, *See* Strehlow, R.A., 9:3057
**Orrison, L.H.**, Legionella oakridgensis: unusual new species isolated from cooling tower water, 9:3386 (J;US)
**Orzechowski, T.J.**, Status of the Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory free electron laser (FEL), 9:3158 (R;US)
**Osakabe, Masahiro**, *See* Adachi, Hiromichi, 9:2438
**Osbourn, G.C.**, InAsSb strained-layer superlattices for long wavelength detector applications, 9:3215 (R;US)
*See* Picraux, S.T., 9:2836, 9:2842
**Oset, E.**, Single-particle Glauber matrix elements, 9:3961 (J;US)
**Osif, T.L.**, *See* Doherty, M.G., 9:1879
**Otruba, J.P.**, *See* Chandrasekaran, K., 9:3028
**Ott, H.R.**, Superconducting ground state of a strongly interacting electron system: $UBe_{13}$, 9:2711 (R;US)

**Otter, C.,** Measurement of the thermal diffusivity of molten $UO_2$, 9:2471 (TG;US)
**Otterlund, L.,** Quark matter formation in high energy nucleus-nucleus collisions - predictions and observations, 9:3935 (RA;XC)
**Ovadyahu, Z.,** Weak localization in indium oxide films, 9:2796 (J;NL)
**Overfield, R.E.,** Photoinduced electron-transfer reactions in a chlorophyllide-pheophorbide cyclophane. A model for photosynthetic reaction centers, 9:3017 (J;US)
**Overseth, O.E.,** Polarizion experiments with hyperons, 9:3700 (RA;US)
XI° experiments, 9:3699 (RA;US)
**Owen, M.,** *See* Nguyen, H., 9:1825
**Owens, V.H.,** *See* Starling, K.E., 9:1790
**Oyama, Yukio,** *See* Tanaka, Shun-ichi, 9:3969
**Ozawa, Kunio,** *See* Yamaguchi, Sadae, 9:3968
**Ozdemir, L.,** Evaluation of mechanical excavation systems for oil-shale mining. Final technical report, 9:1907 (R;US)
**Ozguz, V.,** *See* Narayan, J., 9:2840

## P

**Paap, T.,** Environmental effect of the barriers in the KBS disposal system, 9:2049 (RA;CA)
**Paczynski, B.,** Thick accretion disks around black holes, 9:3495 (BA;DE)
**Padgett, R.A.,** *See* White, C.L., 9:2760
**Pagano, A.,** *See* Bozek, E., 9:3876
**Painter, P.C.,** *See* Kuehn, D.W., 9:1789
**Painter, W.B.,** *See* Specht, W.L., 9:3342
**Pak, N.K.,** *See* Durgut, M., 9:3806
**Pal'mov, V.A.,** *See* Zhilin, P.A., 9:4189
**Palabrica, R.J.,** Overview of the need of manpower supply for a nuclear programme, 9:2317 (R;DE)
**Palen, A.H.,** Separation of safety-related systems at Darlington GS A, 9:2428 (RA;CA)
**Palm, J.,** *See* Kalema, T., 9:2147
**Palmer, B.A.,** *See* Engleman, R. Jr., 9:3227
**Palmer, T.Y.,** Project Flambeau experimental fire measurements, 9:3237 (RA;US)
*See* Kreiss, W.T., 9:3248
**Palmeri, A.,** *See* Bozek, E., 9:3876
**Pan, H.K.,** EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2979 (J;US)
**Pan, Y.C.,** *See* Seidensticker, R.W., 9:2302
**Panayotou, N.F.,** Design and use of nonstandard tensile specimens for irradiated materials testing, 9:3094 (R;US)
**Pande, C.S.,** *See* Welch, D.O., 9:2866
**Pandharipande, V.R.,** *See* Friman, B.L., 9:3958
**Pang, H.,** *See* Abrams, M.J., 9:3045
**Panofsky, W.K.H.,** Evolution of SLAC and its program, 9:3160 (J;US)
**Panter, R.,** Note on experience with MTR fuel in the United Kingdom, 9:2356 (RA;US)
**Panvini, R.S.,** *See* Alam, M.S., 9:3719
**Papastergiou, C.,** *See* Chrysochoides, N.G., 9:2380
**Papatheodorou, G.N.,** Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3596 (J;US)
**Pape, R.,** *See* Napadensky, H., 9:3241
**Papineau, L.,** *See* Alamanos, N., 9:3889
**Papp, Z.,** *See* Varga, G., 9:3367
**Pappalardo, G.,** *See* Bozek, E., 9:3876
**Parcher, J.F.,** *See* Hynes, H.W. Jr., 9:2986
**Parfenov, V.A.,** *See* Glazkov, Yu.Yu., 9:3173
**Parijskij, B.S.,** *See* Belova, T.I., 9:3838
**Park, J.T.,** *See* Rille, E., 9:3599
**Park, W.,** *See* Izzo, R., 9:4120
*See* White, R.B., 9:4117
**Parker, P.D.,** *See* Champagne, A.E., 9:3490
**Parker, S.,** Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2090 (R;US)
**Parker, S.F.,** Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation, 9:2928 (J;US)
**Parker, S.I.,** *See* Taylor, G.N., 9:3732
**Parks, C.C.,** *See* Rosenberg, R.A., 9:2853, 9:2936
**Parks, C.V.,** *See* Cacuci, D.G., 9:2472
**Parks, E.K.,** *See* Wexler, S., 9:3448
**Parr, A.D.,** *See* Molz, F.J., 9:2522
**Partridge, R.,** *See* Edwards, C., 9:3728
**Partridge, R.B.,** *See* Smoot, G.F., 9:3477
**Paschmann, G.,** *See* Sckopke, N., 9:3507
**Pascual, L.G.,** Training of technicians in the nuclear field: university/industry collaboration, 9:2482 (J;US)
**Paskin, A.,** Computer simulation of crack propagation: lattice trapping, 9:3997 (J;GB)
**Passenheim, B.C.,** *See* Erler, J.W., 9:3501
**Patek, P.R.M.,** Design and operational experience with the off-gas cleaning system of the Seibersdorf incinerator plant, 9:1959 (RA;XA)
**Pati, J.C.,** Quark-lepton unification and proton decay, 9:3798 (R;XA)
**Patterson, R.A.,** Stress corrosion testing of 5083 aluminum, 9:2757 (J;US)
**Pauksens, J.,** *See* Mamourian, M., 9:2327
**Paul, A.C.,** *See* Orzechowski, T.J., 9:3158
**Paul, D.D,** Nucleate boiling in drag-reducing polymer solutions, 9:3090 (J;US)
**Paul, H.,** Progress report 1982, 9:3859 (R;AT;In German)
Progress report 1981, 9:3860 (R;AT;In German)
**Paulter, N.,** *See* Galvin, G.J., 9:2874
**Pauwels, J.B.,** *See* Deworm, J.P., 9:3122
**Pavlichenko, O.S.,** *See* Berezhnyj, V.L., 9:4076
**Pavlics, P.,** *See* Yampolsky, J.S., 9:2653
**Pawlak, T.,** *See* Strugalski, Z., 9:3907
**Payet, J.,** *See* Bernas, M., 9:3899
**Payne, A.C. Jr.,** *See* Kolb, G.J., 9:2456
**Payne, G.L.,** *See* Friar, J.L., 9:3874
**Pazonyi, B.,** *See* Petranyi, J., 9:3373
**Peacher, J.L.,** *See* Rille, E., 9:3599
**Pearlstein, L.D.,** *See* Kaiser, T.B., 9:4111
**Pearson, J.S.,** Calculational results compared to benchmark critical experiments on annular tanks, 9:2041 (J;US)
**Pearson, R.G.,** *See* Parker, S.F., 9:2928
*See* Walker, H.W., 9:2961
**Pearton, D.C.G.,** New robust method for the treatment of analytical data, 9:3212 (R;ZA)
*See* Wepener, J.H., 9:3213
**Peck, C.,** *See* Edwards, C., 9:3728
**Peden, C.H.F.,** *See* Parker, S.F., 9:2928
**Peercy, P.S.,** *See* Galvin, G.J., 9:2874
**Pegg, D.J.,** *See* Alton, G.D., 9:3568
**Pegoraro, F.,** *See* Coppi, B., 9:4125
**Pegova, V.S.,** *See* Golubinskij, P.K., 9:4075
**Peinado, M.,** Design and testing of a flexible line suitable for gas transportation, 9:1900 (BA;GB)
**Pellerin, J.,** *See* Rapin, M., 9:2489
**Pellin, M.J.,** *See* Foosnaes, T., 9:3590
**Pelroy, R.A.,** *See* Wilson, B.W., 9:1817, 9:3420
**Pena, B.,** *See* Lopez, C.F., 9:2398
**Pena, J.L.,** Analysis by SIMS and AES of H:$TiO_2$ electrodes, 9:2893 (RA;BR;In Spanish)
**Peng, J.C.,** Search for $K^+$-nucleus states with positive strangeness by the ($K^+$,p) knockout reaction, 9:3909 (RA;US)
*See* Gibbs, W.R., 9:3864
**Peng, T.H.,** *See* Broecker, W.S., 9:3263
**Peng, Y.K.M.,** *See* Kulchar, A.G., 9:4079
**Penko, F.A.,** *See* Orzechowski, T.J., 9:3158
**Penney, T.,** Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2182 (R;US)
**Penzhorn, R.D.,** Treatment of concentrated waste for storage - fixation of concentrated gaseous waste, 9:1963 (R;DE)
**Peperstraete, H.J.,** *See* Muylle, E.P., 9:3270
**Pepper, J.C.,** Carbonate scaling - literature review and analysis, 9:2170 (R;US)
**Peraino, C.,** *See* Stevens, F.J., 9:3427
**Percy, K.E.,** Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3421 (J;NL)
**Perel'shtejn, Eh.A.,** *See* Aleksakhin, Yu.I., 9:3139
*See* Aleksandrov, V.S., 9:3138
**Pereyaslova, N.K.,** *See* Avdyushin, S.I., 9:3459
**Perez, E.,** *See* Giorsetti, D., 9:2366
**Pernot, L.S.,** *See* Thomson, S.J., 9:1806
**Perrott, E.H.,** *See* Hargreaves, R., 9:2247
**Perry, F.C.,** *See* Reedy, E.D. Jr., 9:3157
**Perry, R.J.,** Feynman rules for gauge fields in the presence of a dielectric medium, 9:3849 (J;US)
**Perschmann, W.D.,** Level crossing studies on ion-collisionally excited He atoms in electric and magnetic fields, 9:3602 (B;DE;In German)
**Persily, A.,** Evaluation of an air-to-air heat exchanger, 9:2635 (J;GB)
**Persoon, A.M.,** Polar cap electron DEnsities from de-1 plasma wave observations. Progress report, 9:3500 (R;US)
**Peruzzi, I.,** *See* Fernandez, E., 9:3723
**Peshekhonov, V.D.,** *See* Abdushukurov, D.A., 9:3191
**Peterman, D.J.,** Electronic structure of metal hydrides. VI. Photoemission studies and band theory of VH, NbH, and TaH, 9:2791 (J;US)

**Peterreins, R.,** *See* Schimetschka, E., 9:2417
**Peters, M.W.,** *See* Taylor, G.N., 9:3732
**Petersen, K.L.,** Effects of prescribed burning on nongame birds breeding in sagebrush communities - pre-burn phase, 9:3313 (RA;US)
**Peterson, C.W.,** *See* Johnson, D.W., 9:3072
**Peterson, D.P.,** Some technical issues in geometric modeling, 9:4250 (R;US)
**Peterson, D.T.,** *See* Peterman, D.J., 9:2791
**Peterson, R.J.,** *See* Ullmann, J.L., 9:3917
**Peterson, V.Z.,** *See* Taylor, G.N., 9:3732
**Pethick, C.J.,** *See* Mishra, V.K., 9:3607
**Petranyi, J.,** Electron beam therapy of breast carcinoma. Pt. 3. Early results, 9:3374 (RA;HU;In Hungarian, English)
Electron therapy of breast carcinoma. Pt. 1. Treatment planning, 9:3373 (RA;HU;In Hungarian, English)
**Petrasso, R.,** Fully ionized and total silicon abundances in the Alcator-C tokamak, 9:4142 (J;US)
**Petree, F.,** *See* Griesen, B., 9:4233
**Petronzio, R.,** Hadron physics at the SPS: Theoretical remarks, 9:3617 (RA;XC)
**Petrovich, F.,** *See* Lindgren, R.A., 9:3904
**Petry, R.F.,** *See* Wohn, F.K., 9:3918
**Petschek, A.G.,** *See* Colgate, S.A., 9:3452
**Pettipas, W.H.,** *See* Buckley, L.P., 9:1973
**Peyaud, B.,** Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions, 9:3738 (R;FR;In French)
**Phaneuf, R.A.,** Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules, 9:3569 (J;US)
**Phillips, J.C.,** Nuclear warfare water contamination. Technical report, 9:3333 (R;US)
*See* Goldman, A.I., 9:2844
**Phillips, W.C.,** *See* Hertzog, D.W., 9:3721
**Piasetzky, E.,** Study of pion-nucleus reactions with high-energy pion beams, 9:3869 (RA;US)
*See* Bowman, J.D., 9:3914
*See* Sennhauser, U., 9:3881
**Picard, J.,** Introduction to Feynman graph calculations, 9:3826 (R;FR;In French)
**Piccolo, M.,** *See* Fernandez, E., 9:3723
**Pick, M.A.,** The kinetics of hydrogen absorption-desorption by metals, 9:2075 (BA;US)
**Pickel, E.,** Procedures for maintenance and repairs, 9:2228 (R;DE)
**Pickles, W.L.,** *See* Turner, W.C., 9:4198
**Pickrell, P.W.,** *See* Bostick, W.D., 9:3279
**Picraux, S.T.,** Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2842 (J;US)
Strain measurements by channeling angular scans, 9:2836 (J;US)
**Piekarz, H.,** *See* Hungerford, E.V., 9:3666
**Piel, W.F. Jr.,** *See* Dybdal, K., 9:3932
**Pielaszek, J.,** Catalyst size distributions from x-ray diffraction, 9:2952 (J;US)
**Pierce, R.E.,** Radwaste characterization: key to an optimized waste management plan, 9:2013 (J;US)
**Pierson, W.J.,** Development of wave forecasting methods. Final report, 9:2181 (R;US)
**Pieuchot, M.,** SN 348 telemetry system, 9:1823 (BA;GB)
**Pigford, T.H.,** Effect of repository heating on dissolution of glass waste, 9:2025 (J;US)
*See* Chambre, P.L., 9:2023
*See* Kobayashi, R., 9:2024
**Pilrilae, E.,** Re-refining of industrial spent oils, 9:1858 (R;FI;In Finnish)
**Pike, G.E.,** Impact ionization near GaAs grain boundaries, 9:2841 (J;US)
**Pilch, M.,** *See* Tarbell, W.W., 9:2455
**Pineri, M.,** *See* Pan, H.K., 9:2979
**Pines, A.,** *See* Baum, J., 9:4023
*See* Garbow, J.R., 9:2905
*See* Yen, Y., 9:2873
**Ping-Tung Shaw,** Self-advection of density perturbations on a sloping continental shelf, 9:3445 (J;US)
**Piotrowski, P.A.,** *See* Duncan, C.S., 9:2867
**Pippin, L.C.,** Cultural resources overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:1994 (R;US)
**Pitsakis, M.N.,** Ion cyclotron resonance bridge detector for frequency sweep, 9:3217 (J;US)
**Pitzer, K.S.,** *See* Wood, R.H., 9:2941
**Piwinskii, A.,** *See* Schwartz, L., 9:3258
**Piwinskii, A.J.,** *See* Stout, N.D., 9:2875
**Pizzini, S.,** Development of a 1 pKW photovoltaic concentrator system with silicon cells, 9:2137 (R;XE)
**Planeix, J.M.,** Safety of installations for work at sea, 9:1855 (BA;GB)
**Planery, B.P.,** *See* Hoffert, M.I., 9:3261
**Plassmann, E.A.,** *See* Malenfant, R.E., 9:2397
**Plendl, H.S.,** *See* Liu, L.C., 9:3657
**Plessing, J.,** *See* Wieczorek, H., 9:1951
**Pluta, J.,** *See* Strugalski, Z., 9:3907
**Plyashkevich, S.N.,** *See* Arkhipov, V.V., 9:3638
**Podolske, J.R.,** Measurement of vibration-rotation line strengths of HO using a tunable diode laser, 9:3558 (J;US)
**Poggio, E.C.,** Accuracy functions for confidence bounds: a basis for sample size determination, 9:4259 (D;US)
**Pogutse, O.P.,** *See* Gribkov, V.M., 9:4059
**Pokorny, L.,** *See* Monoki, E., 9:3369
**Pokrovskij, V.N.,** Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3537 (R;SU;In Russian)
**Polgar, I.,** *See* Hermann, A., 9:3379
**Polite, E.V.,** *See* Rankin, R.L., 9:1808
**Polivanskij, V.P.,** *See* Bocharova, I.E., 9:2324
**Pollacco, E.C.,** *See* Cassagnou, Y., 9:3875
**Pollack, H.,** Heat technological investigations on plastic heat exchangers for dry type natural draught cooling towers, 9:2194 (R;DE;In German)
**Pollard, D.,** Development of a simple upper-ocean and sea-ice model, 9:3444 (J;US)
**Polnarev, A.G.,** *See* Kardashev, N.S., 9:3472
**Pongratz, M.B.,** *See* Tan, T.H., 9:3257
**Ponomarev, L.I.,** *See* Bakalov, D.D., 9:3639
**Poonawala, N.A.,** *See* Doherty, M.G., 9:1879
**Poplavskij, V.M.,** *See* Bogoslovskaya, G.P., 9:2260
**Porcella, D.B.,** Protocol for bioassessment of hazardous waste sites. Final report, 9:3290 (R;US)
**Porile, N.T.,** Fragment emission in high-energy proton-nucleus interactions, 9:3929 (RA;US)
**Porkolab, M.,** *See* Takase, Y., 9:4110
**Porter, F.C.,** *See* Edwards, C., 9:3728
**Porter, J.T. II,** *See* West, W.P., 9:3046
**Post, D.E.,** *See* Kulsrud, R.M., 9:4134
**Poster, R.,** *See* Jenkins, C.M., 9:3727
**Postma, A.K.,** *See* Bloom, G.R., 9:2415
**Pothier, N.E.,** Example of remote maintenance in high radiation fields, 9:2272 (RA;CA)
**Pottag, F.W.,** *See* Hama, Y., 9:3628
**Pougheon, F.,** *See* Bernas, M., 9:3899
*See* Shapira, D., 9:3887
**Poulsen, K.D.,** Seismic mapping and geological prognosis for the geothermal prospects Farsoe, Nibe and Loegstoer: exploratory well and reservoir investigation Farsoe-1. Parts 1, 2, and 3, 9:2162 (R;US)
**Powell, J.,** *See* Karkheck, J., 9:2660
**Powell, J.M.,** *See* Varljen, T.C., 9:4209
**Powell, J.R.,** *See* Yu, W.S., 9:4235
**Power, A.,** *See* Parker, S., 9:2090
**Powers, D.E.,** Supersonic copper clusters, 9:3588 (J;US)
**Powers, L.R.,** *See* Arthur, W.J., 9:3288
*See* Craig, T.H., 9:3324
**Pozharov, V.A.,** Program complex for computation of the two-dimensional plasma distribution function in the OGRA-4 magnetic trap, 9:4058 (R;SU;In Russian)
**Prager, S.C.,** *See* Holly, D.J., 9:4090
**Pras, S.,** *See* Levallois, E., 9:1863
**Prasad, D.R.,** *See* Hoffman, M.Z., 9:3010
**Prasad, V.B.,** *See* Deo, B.B., 9:3801
**Prasolov, R.S.,** Effects of surface roughness of horizontal cylinders on heat transfer to air under conditions of natural convection, 9:3091 (TJ;US)
**Pratt, R.H.,** *See* Kissel, L., 9:3572
**Pratt, S.T.,** Resonant multiphoton ionization of $H_2$ via the B $^1\Sigma^+$/sub u/, v = 7, J = 2 and 4 levels with photoelectron energy analysis, 9:3573 (J;US)
**Preel, X.,** Experimentation of micro-irrigation by solar pumping: 1979-1981. Final report, 9:2138 (R;XE;FR)
**Prenant, C.,** *See* Berget, G., 9:3356
**Prentice, D.A.,** *See* Gurley, L.R., 9:3354
**Presley, J.,** *See* Jenkins, D., 9:2269
**Presperin, V.,** *See* Bogdzel', A.A., 9:3190
**Preston, C.C.,** *See* Ruddy, F.H., 9:2205
**Pretzl, K.P.,** Hard scattering and jet physics in connection with real photons, 9:3623 (RA;XC)
**Preuss, W.,** Improvements and standardization of communication means for control room personnel in nuclear power plants, 9:2344 (R;DE;In German)
**Price, K.R.,** *See* Sula, M.J., 9:3280
**Price, R.H.,** *See* Ceglio, N.M., 9:4144
**Priedhorsky, W.C.,** Evidence for an ~300 day period in Cygnus X-1, 9:3488 (J;US)
*See* Terrell, J., 9:3455
**Priemer, R.,** *See* France, D.M., 9:2216
**Prodell, A.,** *See* Allinger, J., 9:3076
**Proffer, W.J.,** *See* Barthel, J.R., 9:3512

**Pron'ko, G.P.,** Some new results in classical theory of relativistic string, 9:3759 (R;SU)
**Prono, D.S.,** Electron-beam guiding and phase-mix damping by an electrostatically charged wire, 9:3144 (J;US)
**Proenitz, D.,** *See* Orzechowski, T.J., 9:3158
**Protheroe, R.J.,** *See* Ormes, J.F., 9:3461
**Proy, G.,** Desulfurization of hot reductive gases by means of metal oxides, 9:1773 (R;DE;In German)
**Pruess, K.,** Heat transfer in fractured geothermal reservoirs with boiling, 9:2161 (J;US)
**Pruzan, P.,** *See* Mills, R.L., 9:2091
**Przyborowski, S.,** *See* Ullmann, W., 9:3120
**Puchyr, P.J.,** Hydraulic fracture simulator theory and application, 9:1889 (RA;US)
**Pucino, A.T.,** *See* Bilello, J.C., 9:2729
**Pugh, E.N.,** *See* Bursle, A.J., 9:2773
**Pugmire, R.J.,** Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1787 (R;US)
**Puigh, R.J.,** In-reactor creep behavior of selected ferritic alloys, 9:2285 (R;US)
*See* Panayotou, N.F., 9:3094
**Pulga, M.,** *See* Lapre, J.F., 9:1824
**Pyecha, T.D.,** *See* Walton, L.A., 9:2232

## Q

**Qian, Y.J.,** Critical-field measurements in Nb-Ti compositon-modulated alloys, 9:2746 (J;US)
**Quade, R.,** *See* Rao, R., 9:1908
**Qualls, G.E.,** H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1759 (R;US)
**Quarles, C.A.,** *See* Kissel, L., 9:3572
**Quesne, C.,** *See* Lorazo, B., 9:3950

## R

**Rabitz, H.,** *See* Chang, B., 9:3575, 9:3593
**Rackley, J.,** *See* Sommer, W.C., 9:2476
**Radousky, H.B.,** Unusual critical-field behavior in Y/sub 1-x/Er/sub x/ $Rh_4B_4$, 9:2789 (J;US)
**Radovic, L.R.,** Importance of catalysis and carbon active sites in lignite char gasification, 9:1785 (D;US)
**Radul, A.O.,** *See* Lebedev, D.R., 9:4018
**Rae, H.K.,** *See* Bain, A.S., 9:2481
**Rafinejad, D.,** *See* Kull, J., 9:2125
**Raghavan, R.,** Performance of wells in naturally fractured reservoirs, 9:1878 (RA;US)
**Ragle, H.V.,** Materials evaluation at the H-Coal Pilot Plant, 9:1761 (R;US)
**Rahman, H.U.,** Nonlinear coupling of drift waves, convective cells, and magnetic drift modes in finite-$\beta$ plasmas, 9:4126 (J;US)
**Rahn, K.A.,** *See* Berg, W.W., 9:3276
**Rainer, F.,** Scandium oxide coatings for high-power UV laser applications, 9:2747 (J;US)
*See* Milam, D., 9:2795
**Rainwater, J.C.,** *See* Hanley, H.J.M., 9:3605
**Rajeswaran, G.,** Substrate temperature dependence of microcrystallinity in plasma-deposited, boron-doped hydrogenated silicon alloys, 9:2837 (J;US)
**Ram, S.N.,** Hadronic couplings of open beauty states, 9:3755 (R;XA)
**Ramacciotti, G.,** *See* Pizzini, S., 9:2137
**Raman, S.,** *See* Dabbs, J.W.T., 9:3942
*See* Walker, R.L., 9:2288
**Ramaty, R.,** NASA/Goddard Space Flight Center contributions to the Workshop on Positron-Electron Pairs in Astrophysics, 9:3462 (R;US)
*See* Lingenfelter, R.E., 9:3470
*See* McKinley, J.M., 9:3471
**Ramavataram, S.,** Recent References January through April 1983, 9:3865 (J;US)
**Ramey, D.W.,** Preparation and characterization of tritium targets, 9:3164 (J;US)
**Ramondetta, P.J.,** Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1820 (R;US)
**Ramos, J.J.,** *See* Coppi, B., 9:4125
**Randall, G.,** *See* Rosehart, R.G., 9:2262
**Rankin, R.L.,** Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82, 9:1808 (R;US)
**Ranne, A.,** *See* Kaerkkaeinen, S., 9:2664
**Ranta, J.,** *See* Lappi, M., 9:1795
*See* Nieminen, M., 9:1814
**Ranta, Y.,** *See* Nieminen, M., 9:2099
**Rao, B.K.,** *See* Kestner, N.R., 9:2944
**Rao, R.,** Application of the HTGR in tar sands oil recovery, 9:1908 (RA;CA)
**Rao, Y.V.C.,** *See* Ahl, J.L., 9:3584
**Rapin, M.,** Standardization and nuclear independence, 9:2489 (J;US)
**Rapoport, H.,** Maintenance in a nuclear power station as an indicator of technological transfer: Atucha-1 experience, 9:2279 (J;US)
**Rapp, R.E.,** Research programs in adsorption carried out in the low temperature laboratory of UFRJ (Brazil), 9:3528 (RA;BR;In Portuguese)
*See* Souza, J.L.D. de, 9:3529
**Raptis, A.,** *See* Lin, W.H., 9:4024
**Rashevskij, V.P.,** *See* Viktorov, Yu.B., 9:3140, 9:3141
**Rasmussen, D.A.,** Measurements of the microwave power in the wall at EBT-I/S, 9:4045 (R;US)
**Rasmussen, M.D.,** *See* O'Brien, M.H., 9:3219
**Rasonyi, J.,** *See* Topscher, Z., 9:3376
**Rau, G.H.,** Animal $^{13}C/^{12}C$ correlates with trophic level in pelagic food webs, 9:3328 (J;US)
**Ravex, J.,** *See* Molnar, S. von, 9:2799
**Rawlston, S.S.,** *See* Lauf, R.J., 9:2801
**Ray, D.L.,** *See* Croff, A.G., 9:2037
**Ray, L.,** *See* Clark, B.C., 9:3895
*See* Hoffmann, G.W., 9:3892
**Raychaudhuri, A.,** Quark mixing angles in the left-right symmetric model with light W/sub R/ from $K^0$-$K^0$ mixing, 9:3809 (R;XA)
**Rayment, J.J.,** *See* Hayzelden, C., 9:2733
**Rayment, R.,** Basic characteristics of low-cost houses in order to reduce the energy consumption for heating: efficiency of heating plants and controls. Final report, January 1978-September 1980, 9:2616 (R;XE)
**Raymond, R.S.,** *See* Ullmann, J.L., 9:3917
**Rayudu, G.V.S.,** Simple approach for single and double column fabrication for radionuclide generators, 9:3047 (J;GB)
**Razumov, A.V.,** *See* Pron'ko, G.P., 9:3759
**Razuvakin, V.N.,** *See* Aleksandrov, V.S., 9:3138
**Read, A.L. Jr.,** *See* Fernandez, E., 9:3723
**Reader, J.,** $3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3597 (J;US)
Revised $3p^6 3d^8\ ^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3566 (J;US)
**Reagan, R.R.,** *See* Tomkins, B.A., 9:2890
**Reanier, R.E.,** *See* Ugolini, F.C., 9:3287
**Rebbi, C.,** *See* Creutz, M., 9:3855
**Recker, R.,** *See* Hick, H., 9:3100
**Redd, E.,** *See* Rille, E., 9:3599
**Redondo, A.,** Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces, 9:2969 (J;US)
**Reeder, P.L.,** Delayed neutron precursors at masses 97—99 and 146—148, 9:3916 (J;US)
**Reedy, E.D. Jr.,** Bremsstrahlung converter debris shields: test and analysis, 9:3157 (R;US)
**Reedy, R.C.,** Cosmologic studies at LAMPF II: the production of cosmogenic nuclides by energetic secondary particles, 9:3451 (RA;US)
**Reents, D.J.,** History and ritual events on a Petexbatun Classic Maya polychrome vessel, 9:4236 (R;US)
*See* Bishop, R.L., 9:2889, 9:4237
**Regen, S.L.,** *See* Kim, B., 9:2995
**Regnaudin, J.,** GIN: integrated navigation and data acquisition system, 9:1822 (BA;GB)
**Rehm, K.E.,** *See* Frekers, D., 9:3893
**Rehmus, P.,** Analysis of periodic perturbations of limit cycles, 9:2956 (J;US)
**Rehn, L.E.,** *See* Averback, R.S., 9:2725
**Rehn, V.,** *See* Rosenberg, R.A., 9:2853, 9:2936
**Rehr, J.J.,** *See* Stoehr, J., 9:2863
**Reichel, H.,** *See* Brandes, H., 9:1904
**Reidy, J.J.,** Studies of the E2 nuclear resonance effect in kaonic atoms, 9:3655 (RA;US)
**Reiman, A.H.,** Helical axis stellarators with noninterlocking planar coils, 9:4200 (J;US)
**Reimers, J.R.,** Complex time dependent wave packet technique for thermal equilibrium systems: Electronic spectra, 9:3553 (J;US)
**Reineking, A.,** Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°, 9:2706 (R;DE;In German)
**Reischl, G.,** *See* Petranyi, J., 9:3373

**Reiter, E.R.,** Teleconnections with tropical precipitation surges, 9:3260 (J;US)
**Reitter, T.A.,** Heat conduction analog model of urban fire spread, 9:3242 (RA;US)
**Reitz, W.E.,** *See* Spooner, S., 9:2776
**Rempel, J.R.,** Structural debris experiments at operation MILL RACE, 9:3070 (RA;US)
**Renard, B.,** *See* Dorel, M., 9:1832
*See* Vandoorne, B., 9:1831
**Renard, M.L.,** Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981, 9:2646 (R;US)
**Repko, W.W.,** *See* Dicus, D.A., 9:3722
**Rest, J.,** *See* Hsieh, T.C., 9:2370
**Reucroft, S.,** *See* Geist, W., 9:3620
**Reyes, J.,** Plasmons in the interphase between two metals, 9:2694 (RA;BR;In Portuguese)
*See* Romero, I., 9:2825
**Reyners, P.,** Sub-seabed burial of radioactive waste and liabilities, 9:1988 (R;FR;In French)
**Reynolds, A.B.,** Experience with breeder reactor courses at the University of Virginia, 9:2292 (J;US)
**Reynolds, T.D.,** Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area, 9:1947 (RA;US)
**Rho, M.,** Topological soliton bag model for baryons, 9:3789 (J;US)
*See* Jackson, A.D., 9:3822
**Rhodes, C.K.,** Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4143 (J;US)
**Rhow, S.K.,** *See* Turski, R.B., 9:2467
**Riazi, A.,** *See* Gandhi, O.P., 9:3429
**Riazuddin,** Neutral current weak interaction without electroweak unification, 9:3796 (R;XA)
*See* Craigie, N.S., 9:3747
**Rice, J.,** *See* Petrasso, R., 9:4142
**Rice, J.G.,** *See* Hassan, Y.A., 9:2238
**Richard, J.M.,** Ground state baryons in the non-relativistic quark model, 9:3769 (R;FR)
Spin dependence in N anti N at low energy, 9:3768 (R;FR)
**Richards, L.W.,** Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3272 (R;US)
**Richardson, M.,** *See* Edwards, C., 9:3728
**Richels, R.,** *See* Douglas, J., 9:4244
**Richter, D.K.,** Technical, environmental and regulatory aspects of waste management and their reflection in the IAEA programme, 9:1965 (R;DE)
**Richter, J.,** Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2707 (R;DE;In German)
**Richter, R.J.,** *See* Meline, F.G., 9:1958
**Ridgely, G.C.,** *See* Baumann, N.P., 9:2277
**Riege, U.,** *See* Kartes, H., 9:1954
**Riemann, T.,** *See* Mann, G., 9:3814
**Riess, R.,** Chemical operating experience in several European pressurized water reactor plants, 9:2230 (R;DE)
Water systems, 9:2227 (R;DE)
**Riggin, R.M.,** *See* Berry, D.A., 9:1859
**Rigny, P.,** *See* Clerc, M., 9:1926
**Riley, P.J.,** Antihyperon-nucleon scattering, 9:3669 (RA;US)
**Riley, R.E.,** *See* Newkirk, L.R., 9:2812
**Rille, E.,** Isotope effect in electron-capture differential cross sections at intermediate energies, 9:3599 (J;US)
**Rinat, A.S.,** Comparative study of the NN$\pi$ system, II. Elastic NN scattering, 9:3780 (R;IL)
**Rindelhardt, U.,** *See* Gehre, G., 9:2213
**Ring, E.J.,** *See* Hansen, R.G., 9:2900
**Ringstroem, B.,** Solid fuels technology in the 80s, 9:2097 (R;SE;In Swedish)
**Rino, C.L.,** High-latitude and equatorial research support for predicting high-altitude nuclear effects. Technical report, 9:3502 (R;US)
**Rios, C.B.,** *See* Melendres, C.A., 9:2939
**Ripin, B.H.,** *See* Herbst, M.J., 9:4191
*See* McLean, E.A., 9:4190
**Ristinen, R.A.,** *See* Ullmann, J.L., 9:3917
**Ritchie, R.H.,** Collective aspects of charged particle track structure in non-metallic solids, 9:3170 (R;US)
**Ritola, J.,** Energy economy of underground spaces and heat storage in bedrock, 9:2632 (R;FI;In Finnish)
**Ritter, M.W.,** *See* Howell, R.H., 9:3132
**Roach, P.,** *See* Nguyen, H., 9:1825
**Roach, P.R.,** Thermal expansion, velocity of sound, and compressibility in liquid $^3$He under pressure, 9:3608 (J;US)
**Roberson, N.R.,** *See* King, S.E., 9:3873
**Roberts, B.L.,** $K^-$ and $\Sigma^-$ atoms and $p(K^-,\gamma)$, 9:3652 (RA;US)
**Roberts, D.I.,** *See* Johnson, W.R., 9:2256
**Roberts, F.P.,** *See* Turcotte, R.P., 9:2794
**Roberts, J.A.,** *See* Phillips, J.C., 9:3333
**Roberts, J.H.,** *See* Ruddy, F.H., 9:2205, 9:2338
**Roberts, T.J.,** *See* Ball, R.C., 9:3733
**Robinson, L.,** COBOL programming standards at Sandia Labs, 9:4249 (R;US)
**Robinson, R.R.,** *See* Longinow, A., 9:3066
**Robles Galvez, J.C.,** *See* Lopez, C.F., 9:2398
**Rocco, J.C.,** *See* Delaunay, M., 9:4231
**Rochelle, G.T.,** Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83, 9:1803 (R;US)
**Rockett, P.D.,** *See* Tarvin, J.A., 9:4201
**Rodgers, S.J.,** *See* Rankin, R.L., 9:1808
**Rodichkin, V.A.,** *See* Burtsev, V.A., 9:4078
**Rodrigues, R.,** *See* Liang, E.P., 9:3483
**Rodriguez, L.,** *See* Bozek, E., 9:3876
**Roe, B.P.,** *See* Ball, R.C., 9:3733
**Roegler, H.J.,** Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB, 9:2372 (RA;US)
**Roganov, V.S.,** *See* Balandin, M.P., 9:3538
**Rogers, D.,** *See* Orzechowski, T.J., 9:3158
**Rogers, J.D.,** *See* Kleiman, G.G., 9:2693
**Rogers, P.S.Z.,** *See* Wood, R.H., 9:2941
**Rogers, R.S.,** *See* Wilbur, D.S., 9:3048
**Rogers, V.C.,** Concentrations of selected short-lived isotopes in a low-level waste inventory, 9:2015 (J;US)
**Rogulien, T.D.,** *See* Matsuda, Y., 9:4100
**Rogov, E.A.,** *See* Gusev, S.V., 9:4188
**Rogov, S.P.,** *See* Voznyakevich, E.V., 9:2333
**Romano, S.A.,** Selecting host states for low-level waste-disposal sites, 9:1949 (R;US)
**Romanov, V.M.,** Investigation of neutron kinetics in the nanosecond range in a depleted uranium sphere, 9:3966 (R;SU;In Russian)
**Romero, I.,** Angular distribution of desorpted atoms of solid surfaces, 9:2825 (RA;BR;In Spanish)
**Romero, J.L.,** *See* Castaneda, C.M., 9:3894
**Romney, E.M.,** $^{90}$Sr and $^{137}$Cs in soil and biota of fallout areas in southern Nevada and Utah, 9:3304 (J;GB)
**Roms, Yu.G.,** Test of electrolytic method for separating bismuth and lead in saline melts, 9:2774 (TJ;US)
**Ronga, F.,** *See* Fernandez, E., 9:3723
**Rosa, G.,** *See* Colonna, S., 9:1901
**Rose, G.,** Economic utilization of geothermal energy, 9:2167 (R;DE;In German)
**Rose, J.B.,** Bruce nuclear project, 9:2316 (R;CA)
**Rose, R.P.,** *See* Varljen, T.C., 9:4215
**Rosehart, R.G.,** Analysis of human error trends at the Pickering A nuclear generating station, 9:2262 (RA;CA)
**Rosen, S.P.,** Neutrino reactions, 9:3680 (RA;US)
No-neutrino double beta decay: more than one neutrino, 9:3712 (R;US)
**Rosenberg, I.,** *See* Ten Haken, R.K., 9:3982
**Rosenberg, R.A.,** Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2936 (J;US)
K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields, 9:2853 (J;US)
**Rosenblatt, G.M.,** Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes, 9:2974 (J;US)
**Rosenblatt, M.,** *See* Hassig, P.J., 9:3235
**Rosenbluth, M.N.,** *See* Berk, H.L., 9:4135
**Rosenthal, S.,** *See* Ferrieri, R.A., 9:3051
**Rosenzweig, S.,** *See* Edwards, D.J., 9:2151
**Roshd, M.,** Low-density moderation in PWR fuel storage, 9:2239 (J;US)
**Ross, J.,** *See* Rehmus, P., 9:2956
**Ross, R.C.,** Reactive sputtering of amorphous silicon in Ne, Ar, and Kr, 9:2850 (J;US)
**Rossat-Mignod, J.,** *See* Burlet, P., 9:2779
**Rossmassler, J.,** *See* Schilling, G., 9:4145
**Rossmeissl, N.P.,** *See* McHale, E.T., 9:3114, 9:3115
**Rotella, F.J.,** Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD/sub\ x/$. I. Preparation and neutron powder diffraction, 9:2715 (J;US)
**Roth, G.,** *See* Weisenburger, S., 9:1961
**Roth, U.,** Efficient energy use in area development planning - reducing heating energy need by measures of

passive use of insolation, 9:2607 (RA;DE;In German)
**Rothberg, J.E.,** *See* Chaloupka, V., 9:3694, 9:3695
**Rothchild, J.,** Residential conservation investments: a practical guide to retrofitting, 9:2630 (R;US)
**Rothgeb, T.M.,** *See* Keniry, M.A., 9:3353
**Rottler, L.,** *See* Groebner, R.J., 9:4085
**Rountree, S.L.K.,** Parametric integer linear programming: a synthesis of branch and bound with cutting planes, 9:4257 (J;NL)
**Roussel, P.,** *See* Bernas, M., 9:3899
**Routbort, J.L.,** *See* Scattergood, R.O., 9:2883
**Rouvel, L.,** Calculation approaches for energy evaluation of buildings, 9:2600 (RA;DE;In German)
**Rouyer, J.L.,** Fusion safety and protection issues: Lessons from fast breeder reactors and reprocessing plant studies, 9:4169 (RA;XA)
**Rowe, J.M.,** Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2852 (J;US)
**Roy, S.C.,** *See* Apfel, R.E., 9:3203
**Royl, P.,** Results of SIMMER-II analysis of fuel migration through the gap between internal fuel element clusters in heterogeneous cores, 9:2508 (B;DE;In German)
**Rozgonyi, G.A.,** *See* Narayan, J., 9:2840
**Rozsa, K.,** He-Ne laser in hollow cathode discharge, 9:3087 (BA;AT)
**Rubin, I.B.,** Chemical characterization and toxicologic evaluation of airborne mixtures. Chemical characterization of combusted inventory red and violet smoke mixes. Final report 1981-1982, 9:3262 (R;US)
*See* Buchanan, M.V., 9:1788
**Rubin, M.H.,** *See* Ondrechen, M.J., 9:3124
**Rubin, M.N.,** Demonstrating the noise control of a coal preparation plant. Volume 2: long term treatment evaluation. Open file report Oct 77-Aug 81, 9:1812 (R;US)
**Ruchti, C.B.,** Survey of free-boundary ion ring equilibria, 9:4101 (J;US)
**Ruddy, F.H.,** Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2205 (R;US)
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2338 (R;US)
**Rudigier, H.,** *See* Ott, H.R., 9:2711
**Rudy, T.E.,** *See* Garelis, E., 9:3089
**Ruedenauer, F.G.,** *See* Wieser, E., 9:2832
**Ruedinger, V.,** Testing HEPA filter response to high flow velocity and overpressure, 9:3119 (RA;XA)
**Ruehle, M.,** Detection of the change in mean inner potential at dislocations in grain boundaries in NiO, 9:2780 (R;US)
**Ruijgrok, T.W.,** Completely solvable model of the nonlinear Boltzmann equation, 9:4040 (J;NL)
**Rumble, E.,** *See* Woodis, A., 9:2315
**Ruscev, M.,** *See* Gai, M., 9:3934
**Rush, J.J.,** *See* Kelley, R.D., 9:2088
*See* Rowe, J.M., 9:2852
**Rusin, J.M.,** *See* Turcotte, R.P., 9:2794
**Rusinko, R.N.,** *See* Walther, J.F., 9:2525
**Russell, C.T.,** *See* Hones, E.W. Jr., 9:3509
*See* Sckopke, N., 9:3507
**Russell, G.M.,** *See* Watson, A.E., 9:2899
**Russell, J.C.,** *See* Hui, Y., 9:2997
**Russell, P.E.,** *See* Chu, T.L., 9:2871
**Rustad, S.,** *See* Andersen, S., 9:2077, 9:2111
*See* Hohle, E., 9:2094
*See* Soma, M., 9:2095
**Rutherford, J.,** Derivation of I/M benefits for pre-1981 light duty vehicles for low altitude, non-California areas, 9:2675 (R;US)
**Rutland, L.,** *See* Dam, A.S., 9:2010
**Ryabtsev, A.,** *See* Reader, J., 9:3566
**Ryali, S.B.,** *See* Mantell, D.A., 9:3587
**Ryan, J.L.,** *See* Sullivan, M.F., 9:3403
**Ryan, M.J.,** Reusable tamper-indicating security seal, 9:3075 (P;US)
**Ryan, R.R.,** *See* Kubas, G.J., 9:2945
**Rye, R.R.,** Auger spectra of tetrahedral halides and hydrides, 9:3574 (J;US)
**Ryerson, F.,** *See* Schwartz, L., 9:3258

## S

**Saakian, S.B.,** Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3868 (R;SU)
**Sabatini, R.L.,** *See* Rajeswaran, G., 9:2837
**Sabelli, N.H.,** The influence of covalency on anion-anion interionic potentials in NiO, 9:2797 (J;GB)
**Sabundjian, G.,** Basic analyses and a comparison of the characteristics of the GCFR and the LMFBR with the thorium cycle in one - group diffusion theory, 9:2300 (B;BR;In Portuguese)
**Sacton, J.,** Search for beauty particles at the CERN SPS, 9:3621 (RA;XC)
**Sadat-Khonsari, A.,** Calculation of stray dose distributions of gamma and X radiation in homogeneous and inhomogeneous media by means of Monte-Carlo methods, 9:3978 (B;DE;In German)
**Sagalovich, V.V.,** *See* Sleptsov, S.N., . 9:2709
**Saha, A.,** Energy variation of the analyzing power in the reaction p/sub pol/+p→d+$\pi^+$, 9:3734 (J;US)
**Saheb, E.,** In-situ rebuild of the Gentilly 2 steam generators, 9:2270 (RA;CA)
**Sahin, S.,** *See* Schneeberger, J.P., 9:2483
**Sailor, V.L.,** *See* Hill, D., 9:2001
**Sakabe, Shuji,** *See* Yamada, Kawakatsu, 9:4061
**Sakai, T.,** Dynamic recrystallization during the transient deformation of a vanadium microalloyed steel, 9:2730 (J;US)
**Sakumoto, Akihisa,** Measurement of corrosion of mild steel in high temperature-pressure pure water under γ-irradiation, 9:2708 (R;JP;In Japanese)
**Sala-mon, P.,** Thermodynamic length and dissipated availability, 9:4029 (J;US)
**Salam, A.,** Witten's charge formula, 9:3799 (R;XA)
*See* Pati, J.C., 9:3798
**Salin, J.G.,** *See* Soeyrilae, P., 9:2657
**Sallans, L.,** Preparation and reactions of $Cr^-$. The Cr-H bond strength, 9:3035 (J;US)
**Salyer, I.O.,** Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3036 (J;US)
**Salzmann, D.,** *See* Eliezer, S., 9:4161
**Samec, T.K.,** *See* Gordon, J.D., 9:2067
**Samojlenko, V.D.,** *See* Gusev, S.V., 9:4188
**Sanadze, V.V.,** *See* Linkevich, A.D., 9:3771
**Sanborn, J.B.,** Attributes mode sampling schemes for international material accountancy verification, 9:2064 (J;US)
**Sanchez-Pope, A.E.,** *See* Varacalle, D.J. Jr., 9:2411
**Sanchez Sinencio, F.,** *See* Pena, J.L., 9:2893
**Sande, B.,** *See* Denning, D., 9:4263
**Sanders, C.L.,** Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3405 (J;US)
**Sanders, R.D.,** *See* Childs, F.W., 9:2180
*See* Dolenc, M.R., 9:2171
**Sanders-Loehr, J.,** *See* Elam, W.T., 9:2946, 9:2970
**Sandford, M.T. II,** *See* Hills, J.G., 9:3475
**Sandford, M.T. Jr.,** *See* Hills, J.G., 9:3476
**Sandquist, G.M.,** *See* Rogers, V.C., 9:2015
**Sanford, T.W.L.,** *See* Goldman, T., 9:3697
**Sano, A.,** *See* Nagaki, H., 9:2029
**Santiago, J.M.,** Structural response of the SATCOM antenna to a blast loading, 9:3069 (RA;US)
**Santo, R.,** *See* Frekers, D., 9:3893
**Santoro, A.F.S.,** Hadron phenomenology, 9:3761 (R;BR;In Portuguese)
**Santos, S.,** *See* Alberi, G., 9:3746
**Santschi, P.H.,** The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3340 (J;GB)
**Sanuki, H.,** Stabilization of electrostatic flute mode due to hot electron ring and rf field, 9:4068 (R;JP)
**Sarma, B.K.,** *See* Qian, Y.J., 9:2746
**Sarmento, E.F.,** Correlation functions of electronic and nuclear spins in a Heisenberg antiferromagnet semi-infinite medium, 9:3522 (RA;BR;In Portuguese)
Surface nuclear spin waves in a semi-infinite ferromagnetic insulator, 9:3526 (RA;BR)
Thermodynamical properties of an Ising ferromagnet in a semi-infinite medium, 9:3523 (RA;BR;In Portuguese)
**Sarracino, R.,** *See* Colgate, S.A., 9:3452
**Sartoris, J.J.,** *See* LaBounty, J.F., 9:2100
**Sasaki, Makoto,** *See* Ishikawa, Makoto, 9:2395
**Sasaki, Shigemi,** *See* Kiritani, Michio, 9:4179
**Susamoto, Nobuo,** *See* Tanaka, Shun-ichi, 9:3969
**Sass, S.L.,** *See* Ruehle, M., 9:2780
*See* Sickafus, K., 9:2682
**Sastre, C.,** *See* Lee, B.S., 9:2255
**Sastre, J.,** *See* Berget, G., 9:3356
**Satija, S.K.,** *See* Hagen, M., 9:2860
**Sato, M.,** JAERI RERTR program, 9:2354 (RA;US)
**Sato, Y.,** *See* Kobayashi, R., 9:2024

**Satterfield, C.N.,** Olefin addition in Fischer-Tropsch synthesis on an iron catalyst, 9:2994 (J;US)
**Satz, H.,** States of matter in QCD, 9:3943 (RA;XC)
**Sauer, M.C. Jr.,** *See* Cooper, R., 9:3038
**Sauerzopf, F.M.,** Symmetry considerations for H/sub c/2 anisotropy experiments in cubic superconductors, 9:4001 (J;US)
**Saunders, M.B.,** *See* Hancher, C.W., 9:3112
**Savage, M.H.,** *See* Joyce, D.C., 9:3730
**Saveliev, M.V.,** *See* Fedoseev, I.A., 9:4008
*See* Leznov, A.N., 9:4037
**Savornin, B.,** *See* Fanjas, Y., 9:2362
**Savrin, V.I.,** *See* Linkevich, A.D., 9:3771
**Sawai, Sadamu,** Role of Fugen HWR in Japan and design of a 600 MWe demonstration reactor, 9:2275 (R;JP)
**Sawamura, O.,** Experimental studies of reflooding in horizontal fuel channels, 9:2424 (RA;CA)
**Sawyer, W.K.,** Concepts and applications in modeling the Devonian shale, 9:1875 (RA;US)
**Saxe, P.,** Cyclic D/sub 6h/ hexaazabenzene--a relative minimum on the $N_6$ potential energy hypersurface, 9:2991 (J;US)
**Saxena, R.N.,** *See* Soares, J.C., 9:3926
**Sayre, E.V.,** *See* Bishop, R.L., 9:2889, 9:4237
*See* Harbottle, G., 9:2888
**Scadron, M.D.,** Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics, 9:3823 (J;US)
**Scandella, C.J.,** *See* Olson, J.M., 9:3352
**Scarbrough, J.O.,** *See* Koch, C.C., 9:2714
**Scarpi, G.,** *See* Pizzini, S., 9:2137
**Scattergood, R.O.,** Velocity and size dependences of the erosion rate in silicon, 9:2883 (J;NL)
**Schabes-Retchkiman, P.S.,** Study of krypton and xenon solid monoshells adsorbed in graphite by transmission electron diffraction, 9:2824 (RA;BR;In Spanish)
**Schaefer, G.F.,** Experiences with projects and competitions - demonstration projects for solar energy utilization in residential buildings, 9:2142 (RA;DE;In German)
**Schaefer, H.F. III,** *See* Hoffman, M.R., 9:2996
*See* Saxe, P., 9:2991
*See* Yamaguchi, Y., 9:3586
**Schafer, H.A.,** *See* Rau, G.H., 9:3328
**Schafer, J.,** Economics of low-level radioactive waste disposal, 9:1950 (R;US)
**Schaffhauser, A.C.,** *See* Liu, C.T., 9:2758
**Schanze, K.S.,** Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3009 (J;US)
**Schechter, R.S.,** Development of environmentally attractive leachants. Volume 1. A minitest for in situ uranium leaching, 9:1918 (R;US)
**Scheffee, R.S.,** *See* McHale, E.T., 9:3114, 9:3115
**Scheidker, E.J.,** Production of pions, kaons, and muons by 16-GeV protons, 9:3774 (R;US)
**Scheirle, N.,** *See* Hoecker, K.H., 9:2540
**Schempp, D.,** Solar architecture of the Log-id team - experiences from the experimental greenhouse in Tuebingen, architects' solutions for residential buildings, 9:2143 (RA;DE;In German)
**Scherpelz, R.I.,** *See* Fisher, D.R., 9:3397
**Scherz, A.,** *See* Overfield, R.E., 9:3017
**Schiefelbein, G.F.,** Overview for DOE's Biomass Thermochemical Conversion Program, 9:2086 (R;US)
**Schiemichen, P.C.,** *See* Brandes, H., 9:1904
**Schillaci, M.E.,** *See* MacLaughlin, D.E., 9:2726
**Schilling, G.,** Neutral beam injector performance on the PLT and PDX tokamaks, 9:4145 (BA;GB)
**Schilling, T.,** Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1930 (R;DE;In German)
**Schimetschka, E.,** System study on the development of a core catcher concept for light water reactors. Final report/main volume, 9:2435 (R;DE;In German)
Systems study for development of a core catcher for LWR-type reactors. Final report/materials, 9:2417 (R;DE;In German)
**Schindler, N.,** Secondary systems of PWR and BWR, 9:2210 (R;DE)
**Schink, G.R.,** *See* Guill, G.D., 9:2537
**Schirber, J.E.,** Comment on "Prediction of Fermi-surface pressure dependence in Rb and Cs", 9:2738 (J;US)
**Schissel, P.,** Polymeric glazings, 9:2149 (R;US)
**Schloemer, E.C.,** *See* Gai, M., 9:3934
**Schlomer, E.A.,** *See* Daniel, J.A., 9:2464
**Schlyer, D.J.,** *See* Ferrieri, R.A., 9:3050, 9:3051
**Schmeling, P.,** *See* Dahlgren, T., 9:2663
**Schmelzer, A.,** *See* Leutwyler, S., 9:3556
**Schmeskal, T.,** *See* Hick, H., 9:3100
**Schmick, H.D.,** Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface, 9:2916 (R;DE;In German)
**Schmid, F.,** Origin of SiC impurities in silicon crystals grown from the melt in vacuums, 9:2121 (R;US)
Silicon slicing by fixed abrasive slicing technique, 9:2119 (R;US)
*See* Khattak, C.P., 9:2120, 9:2122
**Schmid, J.P.,** Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82, 9:1799 (R;US)
**Schmid, M.,** Comparison between solid graphite and graphite cloth as a target backing material for an ISOL system, 9:3161 (J;NL)
**Schmidt, D.,** Peak separation from time-of-flight spectra and problems of detector efficiency determination in neutron spectroscopy, 9:3176 (R;XA)
**Schmidt, E.,** *See* Cooper, W., 9:3129
**Schmidt, M.P.,** *See* Black, J.K., 9:3168
*See* Larsen, R.C., 9:3616
**Schmidt, M.R.,** *See* Schmid, J.P., 9:1799
**Schmidt, S.C.,** Optical diagnostics for condensed-phase shock-compressed molecular systems, 9:3229 (R;US)
**Schmidt Ott, W.,** *See* Bernas, M., 9:3899
**Schmunk, R.E.,** *See* Deis, G.A., 9:4158
**Schnack, D.D.,** Reversed field pinch dynamics and transport studies. Quarterly progress report, 20 July 1983-20 October 1983, 9:4049 (R;US)
**Schneeberger, J.P.,** The program of cooperation between the King Abdulaziz University and the Swiss Federal Institute of Technology in the field of nuclear education and training, 9:2483 (J;US)
**Schneller, S.G.,** Design criteria for rotating machinery to withstand fast electric bus transfer, 9:2334 (RA;CA)
**Scholz, M.H.,** *See* Joyce, D.C., 9:3730
**Schow, O.E.,** *See* Chen, Y., 9:2792
**Schrack, R.A.,** *See* Behrens, J.W., 9:2039
**Schrader, G.L.,** In situ laser Raman spectroscopy of the sulfiding of Mo/ $\gamma$-$Al_2O_3$ catalysts, 9:2951 (J;US)
**Schraube, H.,** *See* Swaja, R.E., 9:3980
**Schreck, H.,** 'Passive' utilization of solar energy, 9:2141 (RA;DE;In German)
**Schreiber, J.,** Testing and performance characteristics of a 1-kW free piston Stirling engine, 9:2672 (R;US)
**Schroeder, H.J.,** *See* Riess, R., 9:2230
**Schroeder, W.U.,** *See* Breuer, H., 9:3897
**Schubert, W.K.,** *See* Lenahan, P.M., 9:2834
**Schuenemeyer, J.H.,** *See* Drew, L.J., 9:1819
**Schulte, B.,** *See* Wiese, H., 9:1946
**Schulte, H.,** Design of compression heat pumps driven by diesel engines for domestic heating systems, 9:2621 (R;DE;In German)
**Schultz, K.R.,** *See* Hopkins, G.R., 9:4217
**Schultz, T.W.,** Structure activity relationships: their function in biological prediction, 9:3409 (R;US)
**Schultz, V.,** *See* Whicker, F.W., 9:3306
**Schultz, W.W.,** Ion exchange and adsorption in nuclear chemical engineering, 9:2892 (R;US)
**Schulz, W.W.,** Some chemical issues involved in the management and disposal of TRU wastes, 9:2035 (J;US)
**Schumacher, R.J.,** *See* Barnhart, B.V., 9:3230
**Schuman, R.P.,** Leach testing of INEL waste forms in a gamma field, 9:2028 (J;US)
**Schuresko, D.D.,** Evaluation of developmental industrial hygiene instrumentation at the University of Minnesota-Duluth gasifier, 9:3269 (R;US)
Performance characterization of pneumatic single pellet injection system, 9:4152 (R;US)
**Schwarz, R.,** *See* Hick, H., 9:3100
**Schwartz, L.,** Glass produced by underground nuclear explosions, 9:3258 (R;US)
**Schwartz, M.,** Determining the lifetime of the $\pi$/sup +-/$\mu$/sup -+/ atom, 9:3704 (RA;US)
**Schwartz, S.D.,** System-bath decomposition of the reaction path Hamiltonian. II. Rotationally inelastic reactive scattering of $H+H_2$ in three dimensions, 9:3559 (J;US)
*See* Miller, W.H., 9:2920
**Schwarz, C.B.,** *See* Black, J.K., 9:3168
**Schwarz, R.,** *See* Bauer, J., 9:2416
**Schwarz, U.,** Grounding system of TEXTOR, 9:4234 (BA;GB)
**Schweitzer, D.G.,** *See* Lee, B.S., 9:2255

**Schweitzer, M.,** *See* Chester, C.V., 9:4277
**Schweik, F.C.,** *See* Helmick, H.H., 9:2304
**Schweike, D.W.,** Tests of the quasiclassical trajectory cross-correlation moment method against accurate quantum dynamics for V—V energy transfer in HF—HF collisions, 9:3594 (J;US)
**Schwimmer, A.,** *See* Elitzur, S., 9:3844
**Sckopke, N.,** Evolution of ion distributions across the nearly perpendicular bow shock: specularly and non-specularly reflected-gyrating ions, 9:3507 (J;US)
**Scott, A.J.,** *See* Becker, C.D., 9:3424
**Scott, D.A.,** 600 MW steam generator repair program. Hydraulically expanded tube tó tubesheet joints, 9:2265 (RA;CA)
**Scott, J.,** *See* Gallagher, A., 9:2126, 9:2127
**Seaverson, L.M.,** *See* Kamitakahara, W.A., 9:2785
**Seay, J.M.,** A spent fuel storage system for LMFBR fuel experiments, 9:2295 (J;US)
**Sebastiani, G.,** General study and field testing of deep water submarine pipelines, 9:1867 (BA;GB)
**Sedlacek, W.A.,** *See* Mroz, E.J., 9:3275
**Seeboeck, R.,** Investigation of lattice defects in zinc after proton and electron irradiation, 9:2705 (R;DE;In German)
**Seeger, A.,** *See* Maier, K., 9:3970
**Seegmiller, D.S.,** *See* Chappell, J.R., 9:2192
**Seeliger, D.,** *See* Schmidt, D., 9:3176
**Seestrom-Morris, S.J.,** Analysis of elastic and inelastic scattering of 162 MeV pions from $^{13}C$ by an optical potential and a collective model, 9:3888 (J;US)
**Seguin, F.H.,** *See* Petrasso, R., 9:4142
**Seiberg, N.,** *See* Affleck, I., 9:3821
**Seidel, T.,** *See* Schempp, D., 9:2143
**Seidenkranz, T.,** *See* Gehre, G., 9:2213
**Seidensticker, R.W.,** Scoping calculations for design and analysis of large reactor vessels for liquid-metal fast breeder reactor (LMFBR) plants, 9:2302 (BA;US)
**Seidl, E.,** *See* Sauerzopf, F.M., 9:4001
**Seifert, E.,** Present and future tendencies of window technique, 9:2603 (RA;DE;In German)
**Seifert, H.,** *See* Eichele, R., 9:3074
**Seiffert, V.,** Detection of flow mixing processes using transmission methods in high-duty heat exchanging apparatus. Final report for the sub-project E6, 9:3088 (R;DE;In German)
**Seise, A.,** *See* Sistonen, M., 9:2642
**Seki, R.,** Measurement of two-nucleon absorption rates in $K^-$ absorption at rest, 9:3656 (RA;US)
**Seki, Yasushi,** *See* Kawasaki, Hiromitsu, 9:3182
**Sekula, S.T.,** *See* Thompson, J.R., 9:2743
**Selikov, A.V.,** *See* Grebenyuk, V.M., 9:3210
**Selivanov, V.M.,** *See* Kornienko, Yu.N., 9:2204
**Sellin, I.A.,** *See* Breinig, M., 9:3561
**Sellstroem, As.,** *See* Estborn, L., 9:3411
**Seltzer, R.,** Toxicology data bank steps up efforts, 9:4264 (J;US)
**Selzer, S.,** *See* Majlis, N., 9:3984
**Semenov, O.V.,** *See* Gusev, S.V., 9:4188
**Semenov, V.A.,** *See* Glazkov, Yu.Yu., 9:3173
**Semerdzhiev, Kh.,** Computer code realization for a mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber, 9:3536 (R;SU;In Russian)
**Sen, A.,** *See* Mitchell, J.B.A., 9:3565
**Senich, G.A.,** Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3033 (R;US)
**Senjanovic, G.,** Necessity of intermediate mass scales in grand unified theories with spontaneously broken CP invariance, 9:3830 (R;XA)
*See* Mohapatra, R.N., 9:3804
**Senn, R.L.,** Irradiation testing of miniature fuel plates for the RERTR program, 9:2358 (RA;US)
**Sennhauser, U.,** Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3881 (J;US)
*See* Bowman, J.D., 9:3914
**Sens, J.C.,** *See* van Driel, M.A., 9:3200
**Sergeev, A.P.,** *See* Viktorov, Yu.B., 9:3140
**Sergeeva, N.V.,** *See* Baranov, V.A., 9:3187
**Sermet, P.,** *See* Delaunay, M., 9:4231
**Serot, B.D.,** *See* Clark, B.C., 9:3895
**Servian, J.L.,** Responsibilities and tasks of nuclear research centers in developing countries, 9:2399 (J;US)
**Seth, K.K.,** *See* Saha, A., 9:3734
**Severin, C.S.,** High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2740 (J;US)
**Severud, L.K.,** Thermal-buckling analysis of an LMFBR overflow vessel, 9:2413 (R;US)
**Sexton, E.,** *See* Jordan, J., 9:1791
**Seya, Toko,** *See* Tadokoro, Yoshihiro, 9:2251
**Shafer, R.A.,** *See* Kazanas, D., 9:3469
**Shah, Y.,** *See* Albal, R., 9:1768
**Shaing, K.C.,** Neoclassical flows and transport in nonaxisymmetric toroidal plasmas, 9:4093 (J;US)
Viscosity-driven impurity transport in a stellarator, 9:4091 (J;US)
**Shalyapin, V.N.,** *See* Aleksandrov, V.S., 9:3138
**Shaner, J.W.,** *See* Schmidt, S.C., 9:3229
**Shannon, T.E.,** Engineering aspects of the INTOR design, 9:4206 (BA;XA)
**Shapira, D.,** Fusion and peripheral processes in the collisions of $^{20}Ne+$ $^{20}Ne$ and $^{20}Ne+$ $^{16}O$, 9:3887 (J;US)
**Shapira, H.B.,** *See* Chester, C.V., 9:4277
**Sharapov, V.N.,** *See* Shulepin, V.S., 9:2323
**Sharp, W.R.,** *See* Ozdemir, L., 9:1907
**Shaw, E.K.,** *See* Olson, J.M., 9:3352
**Shaw, R.W. Jr.,** *See* Stevens, R.K., 9:3271
**Shawhan, S.D.,** *See* Persoon, A.M., 9:3500
**Shawn, L.W.,** *See* Goldman, M.I., 9:2463
**Sheffield, S.A.,** *See* Bloomquist, D.D., 9:3222
**Shehata, B.I.,** *See* Santiago, J.M., 9:3069
**Sheinin, Y.,** *See* Guill, G.D., 9:2537
**Sheldon, A.L.,** *See* Newbold, J.D., 9:3341
**Sheline, R.K.,** *See* Decman, D.J., 9:3931
**Shelkov, G.A.,** *See* Krumshtejn, Z.V., 9:3185
**Shellard, R.C.,** *See* Natale, A.A., 9:3833
**Shelton, R.B.,** Changing energy research priorities, 9:2547 (R;US)
**Shelton, R.N.,** *See* Vining, C.B., 9:2861
**Shen, Y.R.,** *See* Heinz, T.F., 9:2908
*See* Huisken, F., 9:3022
**Shenton, L.R.,** *See* Bowman, K.O., 9:4258
**Sherman, G.R.,** *See* Dormuth, K.W., 9:1977
**Shetty, D.K.,** Stress-relaxation technique for deformation studies in four-point bend tests: application to polycrystalline ceramics at elevated temperatures, 9:2805 (J;GB)
**Sheverev, V.A.,** *See* Burtsev, V.A., 9:4078
**Shiba, H.,** *See* Yoshizawa, H., 9:2847
**Shiba, K.,** *See* Watanabe, K., 9:3096
**Shibata, S.,** *See* Karol, P.J., 9:3902
**Shidlovskij, A.V.,** *See* Aleshin, Yu.D., 9:3633
**Shields, D.H.,** Innovation required in the disposal of uranium mine wastes, 9:1975 (RA;CA)
**Shields, F.D.,** *See* Bass, H.E., 9:2839
**Shih, C.C.,** *See* Carruthers, P., 9:3792
**Shih, J.N.,** *See* Smith, P.H., 9:2523
**Shimeck, D.J.,** *See* Chen, Y.S., 9:2409
**Shinn, J.H.,** *See* Leitner, P., 9:3273
**Shinsky, K.A.,** *See* Carr, J., 9:3735
**Shiotani, M.,** *See* Tatsumi, K., 9:2938
**Shirakawa, H.,** *See* Tang, J., 9:2818
**Shirane, G.,** *See* Hagen, M., 9:2860
*See* Yoshizawa, H., 9:2847
**Shirkov, G.D.,** *See* Aleksandrov, V.S., 9:3138
**Shishkin, A.I.,** *See* Budyashov, Yu.G., 9:3184
**Shiue, C.,** Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow, 9:3049 (J;GB)
**Shiue, C.Y.,** *See* Zhou, Y.G., 9:3052
**Shivakuma, B.,** *See* Gai, M., 9:3934
**Shkarlet, V.D.,** *See* Aleshin, Yu.D., 9:3633
**Shkarofsky, I.P.,** Heat transport with cold and hot electrons allowing for flux limitation by Shvarts' method, 9:4203 (J;US)
**Short, R.W.,** *See* Simon, A., 9:4122
**Shoshani, A.,** *See* Denning, D., 9:4263
**Shoucri, M.,** Dispersion relation for a relativistic electron beam in a plasma, 9:4121 (J;US)
**Shulepin, V.S.,** Averaging of constants in the $B^2$ approximation for reactor calculation, 9:2323 (R;SU;In Russian)
**Shumar, M.L.,** FActors affecting the distributions of two subspecies of big sagebrush, 9:3311 (RA;US)
Sagebrush distributions on the Idaho National Engineering Laboratory, 9:3310 (RA;US)
**Shumovsky, A.S.,** Microscopic model for superconductor with normal state nuclei, 9:4000 (R;SU)
**Shurygin, R.V.,** *See* Gribkov, V.M., 9:4059
**Shusterman, A.J.,** *See* Burch, R.R., 9:2988
**Sickafus, K.,** Observation of the effect of solute segregation on grain boundary structure, 9:2682 (R;US)
**Sieber, R.,** *See* Preuss, W., 9:2344
**Siegel, B.Z.,** *See* Siegel, S.M., 9:3423
**Siegel, R.W.,** *See* Fluss, M.J., 9:2772
**Siegel, S.M.,** The Hawaii geothermal project: phytotoxicity of geothermal separator brine, an exploratory study, 9:3423 (J;NL)
**Siemon, R.E.,** Experimental studies of field-reversed configuration confinement in FRX-C, 9:4137 (BA;XA)
**Sierk, A.J.,** *See* Davies, K.T.R., 9:3957
**Sievers, R.H.,** *See* Phillips, J.C., 9:3333
**Silmes, H.,** Energy research in the mechanical forest industry 1980-1982.

The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2130 (R;FI;In Finnish)
**Silbar, R.R.**, Executive summary, 9:3127 (RA;US)
Overview, 9:3151 (RA;US)
**Silk, J.**, Decay of long-lived particles in the early universe, 9:3491 (J;US)
**Silva, C.E.T.G. da**, *See* Kumar, V., 9:3519
**Silva, S.A. da**, *See* Contar, J.M.R., 9:3177
**Silva Carrico, A. da**, Analysis of the phonon surface specific heat using Green function techniques, 9:3986 (RA;BR)
**Silviera, D.J.**, *See* FitzPatrick, V.F., 9:2004
*See* Oma, K.H., 9:2002
**Simmons, J.E.**, Studies of anti NN polarization experiments at LAMPF II, 9:3663 (RA;US)
**Simon, A.**, Inhomogeneous two-plasmon instability, 9:4122 (J;US)
**Simon, R.**, Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields, 9:4004 (R;US)
*See* Mukunda, N., 9:4003
*See* Sudarshan, E.C.G., 9:4005
**Simon, W.A.**, *See* Stansfield, O.M., 9:2245
**Simoncsics, L.**, *See* Hermann, A., 9:3379
**Simonen, T.C.**, *See* Turner, W.C., 9:4198
**Simonini, R.**, *See* Coceva, C., 9:3162
**Simons, R.L.**, *See* Heinisch, H.L., 9:2689
**Simpson, W.I.**, *See* Miller, D.L., 9:2129
*See* Yang, H.T., 9:2128
**Sims, C.S.**, *See* Swaja, R.E., 9:3980
**Sindorf, D.W.**, $^{13}C$ CP/MAS NMR study of molecular motion in n-alkylsilanes bonded to the silica surface, 9:2948 (J;US)
Cross-polarization/magic-angle-spinning silicon-29 nuclear magnetic resonance study of silica gel using trimethylsilane bonding as a probe of surface geometry and reactivity, 9:2968 (J;US)
$^{29}Si$ NMR study of dehydrated/rehydrated silica gel using cross polarization and magic-angle spinning, 9:2954 (J;US)
**Singh, C.P.**, *See* Ram, S.N., 9:3755
**Singh, R.N.**, *See* Dusek, J.T., 9:2592
**Singh, S.C.**, *See* Khanna, K.M., 9:4060
**Sinha, K.P.**, Development of a 3-D simulator for hydraulic fracturing, 9:1890 (RA;US)
**Sinha, S.K.**, *See* Fedro, A.J., 9:3996
**Sipilae, K.**, *See* Kaerkkaeinen, S., 9:2664
**Sipowicz, W.W.**, *See* Dickson, J.C., 9:2647
**Sironi, G.**, *See* Smoot, G.F., 9:3477
**Sissingh, R.A.P.**, Preliminary nuclear decommissioning cost study, 9:2431 (RA;CA)
**Sisson, C.E.**, Automated 2-D thermal model to predict temperatures in the material stack of a thermal comparator test device, 9:3101 (R;US)
**Sistonen, M.**, Fuel and tyre costs and driving comfort on the surface dressing, 9:2642 (R;FI;In Finnish)
**Sivashinsky, G.I.**, *See* Babchin, A.J., 9:3991
**Sjoreen, T.P.**, *See* Tinsley, J.R., 9:3933
**Skachkov, N.B.**, *See* Linkevich, A.D., 9:3771
**Skank, H.D.**, *See* O'Brien, M.H., 9:3219
**Skarita, J.**, *See* Allinger, J., 9:3076
**Skiff, F.**, *See* Wong, K.L., 9:4116
**Skinner, G.B.**, *See* Bernfeld, D., 9:2984
**Sklad, P.S.**, Phase identification in $TiB_2Ni$ composites by analytical electron microscopy, 9:2803 (BA;US)
**Skog, K.E.**, Survey completion report: residential fuelwood use in the United States: 1980-81, 9:2093 (R;US)
**Skutch, M.E.**, *See* Duncan, C.S., 9:2867
**Slaga, T.J.**, *See* Fischer, S.M., 9:3428
**Slater, D.C.**, *See* Tarvin, J.A., 9:4201
**Slaughter, D.R.**, *See* Chong, Y.P., 9:3143
**Slavnov, D.A.**, *See* Dubinin, M.N., 9:3760
**Slawson, T.R.**, *See* Kiger, S.A., 9:3068
**Slegers, W.**, *See* Deworm, J.P., 9:3122
**Sleptsov, S.N.**, Diffusion decay of binary precipitation in "transitional" asymptotic range, 9:2709 (R;SU;In Russian)
**Slezov, V.V.**, *See* Sleptsov, S.N., 9:2709
**Slichter, C.P.**, NMR study of platinum catalysts, 9:2762 (J;NL)
**Slovinskij, B.**, *See* Mulas, Eh., 9:3189
**Small, G.J.**, *See* Fearey, B.L., 9:2983
**Small, R.D.**, Analysis of the large urban fire environment, 9:3238 (RA;US)
Thermal radiation from a nuclear weapon burst, 9:3250 (RA;US)
*See* Brode, H.L., 9:3234, 9:3249
*See* Larson, D.A., 9:3239
**Smalley, R.E.**, *See* Morse, M.D., 9:3547
*See* Powers, D.E., 9:3588
**Smedskjaer, L.C.**, *See* Fluss, M.J., 9:2772
**Smet, M. de**, *See* Klein, M., 9:1960
**Smirnov, A.Yu.**, *See* Berezinskij, V.S., 9:3817
**Smith, A.D.**, *See* Saha, A., 9:3734
**Smith, A.R.**, Cross sections for the production of $^{11}C$ in C targets by $^{12}C$ at relativistic energies, 9:3885 (J;US)
**Smith, D.J.**, Tracer tests on furnaces at Metalloys Limited, 9:3116 (R;ZA)
**Smith, E.J.**, *See* Baker, D.N., 9:3508
**Smith, J.G.**, *See* Fernandez, E., 9:3723
**Smith, J.L.**, Magnetism in transuranics (invited), 9:2741 (J;US)
*See* Huang, S.Z., 9:2764
*See* Ott, H.R., 9:2711
**Smith, J.R.**, Application of a concrete articulated buoyant column to offshore drilling and production systems, 9:1839 (BA;GB)
**Smith, K.M.**, Aggregation of the bacteriochlorophylls c, d, and e. Models for the antenna chlorophylls of green and brown photosynthetic bacteria, 9:2998 (J;US)
**Smith, K.S.**, Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'", 9:2330 (J;US)
**Smith, P.H.**, Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82, 9:2523 (R;US)
**Smith, R.**, A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport, 9:3077 (J;US)
**Smith, R.J.**, Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2722 (J;US)
**Smith, R.L.**, *See* Keniry, M.A., 9:3353
*See* McLean, W., 9:2790
**Smith, T.B.**, *See* Farr, A.P. Jr., 9:3071
**Smith, T.H.**, *See* Mayberry, J.L., 9:2038
**Smith, W.L.**, *See* Linford, G.J., 9:4232
**Smith-Magowan, D.**, *See* Wood, R.H., 9:2941
**Smither, R.K.**, *See* Frekers, D., 9:3893
**Smithrick, J.J.**, Cycle life test and failure model of nickel-hydrogen cells, 9:2527 (R;US)
**Smoot, G.F.**, Low-frequency measurement of the spectrum of the cosmic background radiation, 9:3477 (J;US)
**Smykov, L.A.**, *See* Abdushukurov, D.A., 9:3191
**Snelgrove, J.L.**, *See* Bretscher, M.M., 9:2375
**Snell, A.H.**, *See* Shapira, D., 9:3887
**Snover, K.A.**, Giant dipole resonances built on excited states, 9:3891 (R;US)
**Snyder, K.**, *See* Linford, G.J., 9:4232
**Soares, J.C.**, Decay of 399 KeV isomeric state in $^{197}Pt$. A possible candidate for PAC studies, 9:3926 (R;BR)
**Socolovsky, M.**, Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3800 (R;XA)
**Soenju, O.K.**, Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2098 (R;NO)
**Soeyrilae, P.**, Energy research in the mechanical forest industry 1980-1982. Optimization of veneer drying, 9:2657 (R;FI;In Finnish)
**Soffer, J.**, Polarization as a tool for studying the physics of weak interactions, 9:3739 (RA;XC)
**Solantausta, Y.**, High preasure hydrogenation of solid fuels, 9:1781 (R;FI;In Finnish)
**Solin, S.A.**, *See* Kamitakahara, W.A., 9:2785
**Solodovnikov, G.A.**, *See* Likhanskij, V.V., 9:4007
**Solomon, A.A.**, Growth and interconnection of pressurized pores in nickel and relation to stress rupture models, 9:2734 (J;US)
**Solomon, A.D.**, Mathematical modeling of TES subsystems, 9:2519 (R;US)
**Solomon, P.R.**, Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83, 9:1793 (R;US)
**Solov'ev, V.G.**, Vibrational states of deformed odd nuclei, 9:3923 (R;SU;In Russian)
**Soloviev, L.D.**, *See* Pron'ko, G.P., 9:3759
**Som, D.K.**, *See* Paskin, A., 9:3997
**Soma, M.**, Charcoal based $CO_2$-generator for use in greenhouses, 9:2650 (R;NO;In Norwegian)
Pyrolysis tests with Cornell retort in production of charcoal, 9:2095 (R;NO;In Norwegian)
**Sommer, W.C.**, A functional system definition for operations, testing, and training, 9:2476 (J;US)
**Somorjai, G.A.**, *See* Garfunkel, E.L., 9:2932
*See* McLean, W., 9:2790
*See* Van Hove, M.A., 9:2862
**Soaneck, G.**, Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3196 (R;AT;In German)
**Sonnenschein, J.**, *See* Davidson, A., 9:3840, 9:3841
**Sorokin, A.P.**, *See* Bogoslovskaya, G.P., 9:2260

**Soter, S.,** *See* Gold, T., 9:1877
**Souder, P.A.,** Rare processes, 9:3708 (RA;US)
**Soulie, G.,** Deep sea productions: construction and operation of a pump down tools testing station in a production well, 9:1841 (BA;GB)
**Souza, E.P. de,** *See* Souza, J.L.D. de, 9:3529
**Souza, J.L.D. de,** Thermodynamic analysis of the adosrbed Ne in exfoliated graphite, 9:3529 (RA;BR;In Portuguese)
**Souza, P.G. de,** Studies in the CdS/$Cu_2S$ heterojunction, 9:2827 (RA;BR;In Portuguese)
**Souza Barros, F. de,** *See* Contar, J.M.R., 9:3177
**Souza Sarkis, J.E. de,** Determination of burnup in irradiated nuclear fuels by the method of stable $^{148}$Nd fission products, 9:2342 (B;BR;In Portuguese)
**Spaeth, M.L.,** *See* Davis, J.I., 9:2070
**Spain, I.L.,** Experiments with phase transitions at very high pressure. Final Report, 9:2831 (R;US)
**Spain, U.C.,** Adaptation of natural microbial communities to degradation of xenobiotic compounds: effects of concentration, exposure time, inoculum, and chemical structure, 9:3385 (J;US)
**Spall, W.D.,** *See* Gurley, L.R., 9:3354
**Spear, W.E.,** Ion implantation of glow discharge amorphous silicon and possible application to solar cell devices, 9:2110 (R;XE)
**Specht, W.L.,** Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3342 (R;US)
**Spencer, R.,** *See* Kull, J., 9:2125
**Spencer, R.B.,** *See* Brown, C.E., 9:3351
**Sperry, P.D.,** *See* Berg, W.W., 9:3276
**Spicer, C.W.,** *See* Berry, D.A., 9:1859
**Spilker, H.,** Different types of intermediate storages, 9:1942 (R;DE)
**Spirchenko, Yu.V.,** *See* Gusev, S.V., 9:4188
**Spitalnik, J.,** Simulator training for nuclear power plant operation in Brazil, 9:2484 (J;US)
**Spoerlein, R.L.,** *See* Prono, D.S., 9:3144
**Spong, D.A.,** *See* Hiroe, S., 9:4082
**Spooner, S.,** Preliminary small angle neutron scattering investigations of neutron irradiation produced voids, 9:2776 (BA;US)
**Sprott, J.C.,** *See* Holly, D.J., 9:4090
**Squires, R.R.,** *See* Sallans, L., 9:3035
**Sridhar, T.S.,** Canadian development program for off-gas management in nuclear facilities, 9:2261 (RA;XA)
**Srivastava, S.,** *See* Cartwright, D.C., 9:3549
**Srivastava, V.J.,** *See* Biljetina, R., 9:2080
*See* Fannin, K.F., 9:2085
**St. Lorant, S.,** *See* Farkas, Z., 9:3128
**Stacey, W.M. Jr.,** *See* Iso, Y., 9:4205
**Stack, D.W.,** Accident sequence evaluation for IREP, 9:2502 (BA;US)
**Stafford, M.P.,** Insects associated with sagebrush communities at the Idaho National Engineering Laboratory, 9:3316 (RA;US)
**Stahl, D.,** *See* Domagala, R.F., 9:2357
**Stahl, J.,** *See* Jordan, J., 9:1791
**Stalder, C.J.,** Supported palladium catalysts for the reduction of sodium bicarbonate to sodium formate in aqueous solution at room temperature and one atmosphere of hydrogen, 9:2923 (J;US)
**Staley, R.H.,** *See* Halle, L.F., 9:2971
**Stallard, M.D.,** *See* Hiorns, D.S., 9:2248
**Stamper, J.A.,** *See* Herbst, M.J., 9:4191
*See* McLean, E.A., 9:4190
**Standke, E.,** Principles and performances of supralethal whole-body irradiation in case of bone-marrow transplantation of patients with acute leukemia, 9:3378 (RA;HU;In Hungarian, German)
**Stanko, M.K.,** *See* Cristol, S.J., 9:3023
**Stansfield, O.M.,** Fuel performance models for high-temperature gas-cooled reactor core design, 9:2245 (R;US)
*See* Turner, R.F., 9:2320
**Starling, K.E.,** Development of a thermodynamic-properties correlation framework for the coal-conversion industry. Final report, September 1, 1980-August 31, 1983, 9:1790 (R;US)
**Starozhukov, D.I.,** *See* Glushak, N.S., 9:2393
**Stassis, C.,** Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$, 9:2742 (J;US)
*See* Thompson, J.R., 9:2743
**States, J.B.,** Assessment of cold-climate environmental research priorities. Appendixes A, B, 9:2544 (R;US)
**Staudhammer, K.P.,** Nucleation and evolution of strain-induced martensitic (b.c.c.) embryos and substructure in stainless steel: a transmission electron microscope study, 9:2735 (J;US)
**Stebbings, J.H.,** *See* Acquavella, J.F., 9:3395
**Stebbins, A.,** *See* Silk, J., 9:3491
**Steiger, W.,** *See* Wieser, E., 9:2832
**Stein, N.,** *See* Gibbs, W.R., 9:3864
*See* Gibson, B.F., 9:3642
*See* Peng, J.C., 9:3909
**Stein, S.L.,** *See* Oma, K.H., 9:2002
**Stein, W.E.,** Electron linacs for laser and radiographic applications, 9:3133 (J;US)
**Steiner, H.M.,** *See* Carr, J., 9:3735
**Steinhaus, D.W.,** *See* Engleman, R. Jr., 9:3227
**Steinkilberg, W.,** Pt. 1: Decommissioning of nuclear facilities. Pt. 2: Methods of decommissioning of nuclear facilities, 9:2388 (R;DE)
**Stell, G.,** *See* Torquato, S., 9:2960
**Stelson, P.H.,** *See* Shapira, D., 9:3887
**Stelzer, W.,** Dynamics of a nuclear power plant. Behaviour of PWR plants during malfunctions and accidents, 9:2420 (R;DE)
Dynamics of a nuclear power plant. Behaviour of PWR plants in normal and upset operation, 9:2421 (R;DE)
**Stemmle, J.T.,** *See* Hanschel, D.B., 9:1805
**Stenger, V.J.,** *See* Taylor, G.N., 9:3732
**Stephen, J.D.,** *See* Harbourne, B.L., 9:2298
**Stephenson, R.,** *See* Bateman, J.E., 9:3197, 9:3383
**Sterbenz, S.M.,** *See* Gai, M., 9:3934
**Stern, B.E.,** *See* Kardashev, N.S., 9:3472
**Stern, E.A.,** *See* Elam, W.T., 9:2946, 9:2970
**Sternheim, M.M.,** *See* Silbar, R.R., 9:3127
**Sternheimer, R.M.,** *See* Beri, A.C., 9:2788
**Steuer, H.,** Spectroscopy of the neutrons from the decay of the giant quadrupole resonance region in $^{208}$Pb, 9:3927 (R;DE;In German)
**Stevens, F.J.,** Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital, 9:3427 (J;US)
**Stevens, R.K.,** Source apportionment methods applied to the determination of the origin of ambient aerosols that affect visibility in forested areas, 9:3271 (R;US)
**Stevenson, B.,** The design, construction, and operation of a working PWR primary loop simulator, 9:2231 (J;US)
**Steverson, J.A.,** Common cause failure rate estimates for diesel generators in nuclear power plants, 9:2505 (BA;US)
**Stewart, B.M.,** Physical property data on coarse anthracite waste. Report of investigations, 9:1801 (R;US)
**Stewart, M.E.,** Interim reliability evaluation program: Browns Ferry fault trees, 9:2500 (BA;US)
**Stewart, M.K.,** Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2894 (R;NZ)
Stable Isotope Group 1981 progress report, 9:2165 (R;NZ)
**Stievano, B.,** *See* Frekers, D., 9:3893
**Stine, J.R.,** Semiclassical inversion procedure for the dipole-moment function for diatomic molecules, 9:3581 (J;US)
**Stine, W.B.,** *See* Harley, E.L., 9:2146
**Stinson, W.P.,** *See* Bunch, W.L., 9:2383
**Stinton, D.P.,** Coating of crystalline nuclear waste forms to improve inertness, 9:2045 (J;US)
**Stochl, R.J.,** IGCC performance comparison for variations in gasifier type and gas turbine firing temperature, 9:2193 (R;US)
**Stock, L.M.,** Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1772 (R;US)
**Stocks, G.M.,** *See* Winter, H., 9:2737
**Stoddart, L.C.,** Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3320 (RA;US)
**Stoddart, T.L.,** *See* Loveland, O.M., 9:1868
**Stoeffl, W.,** *See* Decman, D.J., 9:3931
**Stoehr, J.,** Transition from adiabatic to sudden core-electron excitation: $N_2$ on Ni(100), 9:2863 (J;US)
*See* Rosenberg, R.A., 9:2853
**Stojanik, B.,** *See* Wieczorek, H., 9:1951
**Stokar, S.,** Collective vs atomic models of the hadrons, 9:3782 (R;IL)
**Stoker, D.P.,** *See* Carr, J., 9:3735
**Stokes, E.D.,** *See* Chu, T.L., 9:2871
**Stokes, R.,** *See* O'Neill, R., 9:1882
**Stokstad, R.G.,** *See* Shapira, D., 9:3887
**Stone, W.E.,** *See* Wilbur, D.S., 9:3048
**Stout, N.D.,** Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure, 9:2875 (J;US)
**Stovall, T.K.,** Verification of the DOE Model Audit, 9:2627 (R;US)
**Strahl, J.F.,** *See* Goldman, M.I., 9:2463

**Strasser, H.,** Materials. The Argentine nuclear policy, 9:2553 (B;DE;In German)
**Strathdee, J.,** *See* Salam, A., 9:3799
**Strauch, K.,** *See* Edwards, C., 9:3728
**Strauss, H.R.,** *See* Izzo, R., 9:4120
**Streater, A.,** *See* Molander, W., 9:3544
**Streb, A.J.,** Department of Energy programs on cogeneration and their economics, 9:2554 (BA;US)
**Strehlow, R.A.,** Flame acceleration mechanisms under conditions of partial confinement. Annual report no. 2, Feb 82-Jan 8, 9:3057 (R;US)
**Streib, E.W.,** Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3281 (R;US)
**Streitwieser, A. Jr.,** Some recent advances in uranocene chemistry, 9:2915 (R;US)
**Strip, D.,** Variance reduction in simulation, 9:2492 (BA;US)
**Stritzker, B.,** Superconducting $V_3Si$ produced by pulsed laser annealing, 9:2750 (J;GB)
**Strmen, P.,** Stabilized high voltage power supply of proportional and drift chambers, 9:3183 (R;SU;In Russian)
**Strniste, G.F.,** *See* Okinaka, R.T., 9:3417
**Strongin, M.,** *See* Colbert, J., 9:2739
**Strottman, D.,** *See* Gibbs, W.R., 9:3908
*See* Oset, E., 9:3961
**Strovink, M.,** *See* Carr, J., 9:3735
**Struble, G.L.,** *See* Decman, D.J., 9:3931
**Strugalski, Z.,** Experimental study of the pion-xenon collisions without particle production at 3.5 GeV/c: asymmetry in proton emission, 9:3907 (R;SU)
**Struve, K.W.,** *See* Prono, D.S., 9:3144
**Stubbins, J.F.,** The kinetics of high-temperature carburization in HTGR atmospheres, 9:2257 (J;US)
**Sucov, E.W.,** Westinghouse ICF power plant design, 9:4214 (BA;XA)
**Sudarshan, E.C.G.,** Realization of first order optical systems using thin lenses, 9:4005 (R;US)
*See* Mukunda, N., 9:4003
*See* Simon, R., 9:4004
**Sudo, Yukio,** *See* Adachi, Hiromichi, 9:2438
**Suenaga, M.,** Flux pinning in bronze-processed $Nb_3Sn$ wires, 9:2768 (BA;US)
**Sugahara, R.,** *See* Kawabata, S., 9:3198
**Sugai, H.,** Mode conversion and local heating below the second electron cyclotron harmonic, 9:4066 (R;JP)
**Sugiyama, Kazusuke,** *See* Takahashi, Hideaki, 9:3149
**Sugizaki, Yasuaki,** *See* Yamaguchi, Sadae, 9:3968
**Sula, M.J.,** PUREX environmental radiological surveillance - preoperational and operational support program conducted by Pacific Northwest Laboratory, 9:3280 (R;US)
**Sullivan, J.C.,** *See* Williams, J.M., 9:2819
**Sullivan, L.H.,** *See* Chen, Y.S., 9:2409
**Sullivan, M.F.,** The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3403 (J;US)
The effect of x rays, DTPA, and aspirin on the absorption of plutonium from the gastrointestinal tract of rats, 9:3402 (J;US)
**Sumbaev, A.P.,** *See* Aleksandrov, V.S., 9:3138
**Sumiyoshi, T.,** *See* Kawabata, S., 9:3198
**Summerhayes, R.,** *See* Satterfield, C.N., 9:2994
**Summers, D.P.,** *See* Stalder, C.J., 9:2923
**Summers, G.P.,** Luminescence from oxygen vacancies in MgO crystals thermochemically reduced at high temperatures, 9:2793 (J;US)
*See* Chen, Y., 9:2792
**Summers, H.P.,** *See* Gordon, H., 9:4042
**Sundaram, V.S.,** *See* Kleiman, G.G., 9:2693
**Suominen, E.,** *See* Nieminen, M., 9:1814
**Susman, S.,** *See* Rowe, J.M., 9:2852
**Sutherland, A.A.,** *See* Rogers, V.C., 9:2015
**Sutin, N.,** *See* Bergkamp, M.A., 9:2925
**Sutton, G.,** *See* Kull, J., 9:2125
**Suydam, B.R.,** Scattering and absorption of light by soot particles, 9:4020 (R;US)
**Suzuki, Katsuo,** *See* Tadokoro, Yoshihiro, 9:2251
**Suzuki, N.,** Experience that contribute to operation and maintenance technology transfer, 9:2477 (J;US)
**Svanberg, S.,** Progress Report 1980-81-82, 9:3056 (R;SE)
**Sveum, L.K.,** *See* Clark, R.D., 9:1797
**Sviatoslavsky, I.N.,** UWTOR-M, a stellarator power reactor utilizing modular coils, 9:4225 (BA;XA)
**Svich, V.A.,** *See* Berezhnyj, V.L., 9:4076
**Svidskiy, P.M.,** *See* Avdyushin, S.I., 9:3459
**Svitra, Z.V.,** *See* Wilbur, D.S., 9:3048
**Swain, A.D.,** *See* Bell, B.J., 9:2319
**Swain, J.E.,** *See* Milam, D., 9:2795
**Swaja, R.E.,** 1982 US-CEC neutron personnel dosimetry intercomparison study, 9:3980 (R;US)
**Sweeney, D.W.,** *See* Lucht, R.P., 9:3058
**Sweeney, J.W.,** *See* May, A., 9:3289
**Swenson, L.D.,** *See* Billings, M.P., 9:2343
**Swenson, L.W.,** *See* Tinsley, J.R., 9:3933
**Swider, E.,** *See* Napadensky, H., 9:3241
**Swindeman, R.W.,** *See* White, C.L., 9:2760
**Sydora, R.D.,** Electrostatic Kelvin—Helmholtz instability in a radially injected plasma cloud, 9:4107 (J;US)
**Syhre, H.,** *See* Wieser, E., 9:2832
**Sykes, A.,** *See* Wesson, J.A., 9:4043
**Szebeni, A.,** *See* Szilvasi, I., 9:3370
**Szeverenyi, N.M.,** *See* Bronniman, C.E., 9:2817
**Szilvasi, I.,** Noninvasive imaging of the abdominal aortic aneurysm, 9:3370 (RA;HU;In Hungarian, English)
Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods, 9:3368 (RA;HU;In Hungarian, English)
**Szuster, B.J.,** *See* Brightman, F.G., 9:2246

## T

**Tabaddor, F.,** Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers, 9:2807 (R;US)
Viscoelastic loss characteristics of cord rubber composites, 9:2808 (R;US)
**Tabata, Tatsuo,** Empirical formulas for the reflection of light ions from solids, 9:4174 (RA;JP)
**Taboas, A.L.,** *See* Croff, A.G., 9:2037
**Tabuteau, Alain,** Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3039 (R;FR;In French)
**Tadokoro, Yoshihiro,** System design considerations on the cooling system of the experimental multi-purpose very high temperature gas cooled reactor, 9:2251 (R;JP;In Japanese)
**Taeymans, A.,** *See* Voorde, N. van de, 9:1955
**Tafto, J.,** Structure-factor phase information from two-beam electron diffraction, 9:2864 (J;US)
*See* Rajeswaran, G., 9:2837
**Tagg, B.,** Training of health physics services staff at the Sellafield Works of British Nuclear Fuels, 9:2053 (RA;CA)
**Tahir-Kheli, R.A.,** *See* Sarmento, E.F., 9:3523
**Tajima, T.,** *See* Bhattacharjee, A., 9:4095
*See* Galvao, R.M.O., 9:4054
*See* Sydora, R.D., 9:4107
**Takada, T.,** Theoretical study of the allyl radical: structure and vibrational analysis, 9:2990 (J;US)
**Takahashi, Hideaki,** Background analysis on a detector shield system for fast neutron scattering experiments, 9:3149 (R;JP;In Japanese)
**Takahashi, K.,** *See* Kawabata, S., 9:3198
**Takano, Hideki,** TIMS-PGG: a code system for producing group constants in fast neutron energy region, 9:2329 (R;JP;In Japanese)
**Takase, Y.,** Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks, 9:4110 (J;US)
Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments, 9:4051 (R;US)
**Takata, A.N.,** *See* Waterman, T.E., 9:3245
**Takata, M.,** *See* Acocella, J., 9:2876
**Takeda, R.,** *See* Aoyama, M., 9:2214
**Takeshita, Hidefumi,** *See* Ohno, Hideo, 9:2828
**Talbert, S.G.,** *See* Ball, D.A., 9:2629
**Talbert, W.L.,** *See* Bunker, M.E., 9:3901
**Talbott, J.,** *See* Jordan, J., 9:1791
**Tan, T.H.,** Los Alamos laser simulation of high-altitude nuclear-explosion effects. Final report, 9:3257 (R;US)
**Tanaka, M.,** Bending elasticity of circularly notched bars as monolithic flexure hinges in precision mechanisms, 9:3060 (TG;US)
*See* Baker, N.J., 9:3731
**Tanaka, Shigeya,** *See* Takahashi, Hideaki, 9:3149
**Tanaka, Shun-ichi,** Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct, 9:3969 (R;JP)
**Tanaka, T.J.,** *See* Henke, B.L., 9:4102
**Tang, J.,** Time-domain analysis of EPR measurements of polyacetylene and soliton diffusion, 9:2818 (J;US)
**Tanguy, P.,** International exchange of knowledge with regard to safety, 9:2487 (J;US)

**Tapia H, N.J.,** Structure study and the adsorption system mechanism based on 'stratified volume' model, 9:3527 (RA;BR;In Spanish)
**Tarbell, W.W.,** High pressure melt ejection, 9:2455 (R;US)
**Tarkington, T.W.,** *See* Wright, C.R., 9:1804
**Taroyan, S.P.,** *See* Avakyan, R.O., 9:2822
**Tarquinio, J.,** *See* Loveland, O.M., 9:1868
**Tarrer, A.R.,** *See* Curtis, C.W., 9:1769, 9:1770, 9:1771
*See* Williams, D.C., 9:1762
**Tarvin, J.A.,** Mass-ablation rates in a spherical laser-produced plasma, 9:4201 (J;US)
**Tasaka, K.,** JNDC nuclear data library of fission products, 9:3915 (R;JP)
**Tashiro, Shingo,** *See* Banba, Tsunetaka, 9:1992
**Tata, X.,** *See* Dicus, D.A., 9:3722
**Tatsumi, J.T.,** *See* Harbourne, B.L., 9:2298
**Tatsumi, K.,** Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2938 (J;US)
**Tavkhelidze, A.N.,** *See* Krasnikov, N.V., 9:3764
**Tawil, J.J.,** Guide to radiation fixatives, 9:3044 (R;US)
**Tawshunsky, A.,** *See* O'Neill, R., 9:1882
**Taxil, P.,** *See* Richard, J.M., 9:3769
**Taylor, A.D.,** *See* Howard, J., 9:3975
**Taylor, G.N.,** nu-bar/sub μ/-nucleon charged-current total cross section for 5—250 GeV, 9:3732 (J;US)
*See* Lloyd, R.D., 9:3404
**Taylor, G.W.,** Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2259 (J;NL)
**Taylor, R.D.,** Internal magnetic fields in hcp-iron, 9:2745 (J;US)
**Taylor, W.R.,** *See* Victor, G.A., 9:3598
**Teagan, W.P.,** Stirling engine application study, 9:2671 (R;US)
**Tegner, P.E.,** Rate of the $^3$He(p, $e^+\nu$)$^4$He reaction, 9:3480 (J;US)
**Teixeira e Silva, A.,** Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2441 (R;DE;In German)
**Tejeda, J.,** Mathematical adjusts to ESCA spectra, 9:3531 (RA;BR;In Spanish)
**Teller, R.G.,** *See* Burch, R.R., 9:2988
**Temam, R.,** *See* Foias, C., 9:3611
**Temkin, M.M.,** *See* Burenkov, A.F., 9:3967
**Ten Haken, R.K.,** Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3982 (J;US)
**Teng, T.Y.,** *See* Huang, H.W., 9:3218
**Teo, B.K.,** *See* Antonio, M.R., 9:2942
**Terada, H.,** *See* Wakayama, N., 9:2386
**Terekhov, A.S.,** *See* Gajsler, V.A., 9:2830
**Terrell, J.,** Ten years of Vela x-ray observations, 9:3455 (R;US)
*See* Priedhorsky, W.C., 9:3488
**Teryaev, O.V.,** *See* Efremov, A.V., 9:3772
**Terzi, L.,** *See* Chierici, G.L., 9:1846
**Testoni, J.,** Status of RA3 conversion studies, 9:2377 (RA;US)
**Tetreault, D.J.,** Growth rate of the clump instability, 9:4094 (J;US)
**Tewes, H.,** *See* Schwartz, L., 9:3258
**Thamm, G.,** Irradiation tests of fuel and fuel elements under the German AF program - revised test program, 9:2368 (RA;US)
**Thamm, G.H.,** Objectives and status of the German AF program, 9:2353 (RA;US)
**Theis, T.,** *See* Molnar, S. von, 9:2799
**Thielemann, F.,** *See* Matthews, G.J., 9:3485
**Thiessen, H.A.,** *See* Bhatia, T.S., 9:3152
*See* Scheidker, E.J., 9:3774
*See* Seestrom-Morris, S.J., 9:3888
**Thirumalai, D.,** *See* Schwenke, D.W., 9:3594
**Thoene, E.,** *See* Hoecker, K.H., 9:2540
**Thomas, G.,** The role of environmental conditions in in-situ experiments in the high-voltage electron microscope, 9:3225 (J;DD)
**Thomas, J.C.,** *See* Brown, K.W., 9:1857
**Thomas, K.C.,** *See* Jones, E.D., 9:2727
**Thompson, J.R.,** Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$, 9:2743 (J;US)
*See* Stassis, C., 9:2742
**Thompson, M.O.,** *See* Galvin, G.J., 9:2874
**Thompson, W.A.,** *See* Guentherodt, G., 9:2753
**Thoms, K.R.,** *See* Hobson, D.O., 9:2751
**Thomsen, M.W.,** *See* Farneth, W.E., 9:3019
**Thomson, S.J.,** Assessment of discharges from Sasol I Lurgi-based coal gasification plant. Final report Sep 81-Mar 82, 9:1806 (R;US)
**Thornton, T.A.,** *See* Newman, L.W., 9:2223
**Thorson, I.,** *See* Hanson, M., 9:1807
**Thorulf, P.,** *See* Lagerkvist, B., 9:3413
**Thresh, H.R.,** *See* Domagala, R.F., 9:2357
**Throndsen, T.,** Charcoal for warming and $CO_2$-supply in greenhouses - possible use, 9:2651 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2652 (R;NO;In Norwegian)
$CO_2$- budget in greenhouses with $CO_2$-addition, 9:3266 (R;NO;In Norwegian)
**Thurnauer, M.C.,** Direct observation of radical-pair interaction and decay in anionic micelles. A time-resolved electron-spin-echo study, 9:3020 (J;US)
**Tidemand-Peterson, P.,** *See* Bernas, M., 9:3899
**Tierney, J.,** *See* Albal, R., 9:1768
**Tietjen, G.L.,** *See* Acquavella, J.F., 9:3395
**Tikhomirov, B.B.,** *See* Bogoslovskaya, G.P., 9:2260
**Tilley, D.R.,** *See* King, S.E., 9:3873
*See* Sarmento, E.F., 9:3522
**Timmerman, C.L.,** *See* FitzPatrick, V.F., 9:2004
*See* Oma, K.H., 9:2002
**Tinsley, J.R.,** Observation of 2hω hexadecapole strength in lead nuclei from 200 MeV inelastic proton scattering, 9:3933 (J;US)
**Tkachev, F.V.,** *See* Kataev, A.L., 9:4014, 9:4016
**Tkachev, L.G.,** *See* Krumshtejn, Z.V., 9:3185
**Tobailem, J.,** Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3890 (R;FR;In French)
**Tobin, M.J.,** *See* Karol, P.J., 9:3902
**Todd, A.M.M.,** Monte Carlo studies of tandem-mirror plasmas interacting with waves in the ion-cyclotron range of frequencies (ICRF). Annual report, October 1, 1982-September 30, 1983, 9:4048 (R;US)
**Todd, J.H.,** *See* Bell, Z.W., 9:3898
**Todorovic, M.,** *See* Vujisic, L., 9:2384
**Todorovski, S.,** Improvement of the CANDU power cycle by moderator heat recovery, 9:2268 (RA;CA)
**Toeroek, M.,** *See* Petranyi, J., 9:3374
**Toffano, F.,** *See* Sebastiani, G., 9:1867
**Tohver, H.T.,** *See* Summers, G.P., 9:2793
**Tokarz, R.D.,** Temperature profile detector, 9:2340 (P;US)
**Tolson, J.,** Ben Ocean Lancer: a successful development programme for deepwater drilling, 9:1834 (BA;GB)
**Tom, H.W.K.,** *See* Heinz, T.F., 9:2908
**Tomita, Yukihiro,** *See* Mohri, Akihiro, 9:4074
**Tomkins, B.A.,** Analytical chemistry of polycyclic aromatic hydrocarbons present in coal-fired power plant fly ash, 9:2890 (R;US)
**Tomkinson, J.,** *See* Howard, J., 9:3975
**Tomoda, T.,** *See* Wakayama, N., 9:2386
**Tomozawa, M.,** *See* Acocella, J., 9:2876
**Tomozawa, Y.,** *See* Katsumata, H., 9:3788
*See* Levine, R.Y., 9:3852
**Ton, T.,** *See* Krumshtejn, Z.V., 9:3185
**Tonkay, D.W.,** *See* Goldman, M.I., 9:2463
**Topkov, A.N.,** *See* Berezhnyj, V.L., 9:4076
**Toprac, A.T.,** *See* Rochelle, G.T., 9:1803
**Topscher, Z.,** Localization technique applied for the combined radiation treatment of uterine cancer, 9:3376 (RA;HU;In Hungarian, English)
**Torabi, A.,** *See* Jensen, B., 9:2848, 9:2870
**Torquato, S.,** Microstructure of two-phase random media. II. The Mayer--Montroll and Kirkwood--Salsburg hierarchies, 9:2960 (J;US)
**Torri-Safdi, D.,** *See* Chester, C.V., 9:4277
**Toth, F.,** *See* Kazai, L., 9:3372
**Towse, D.,** *See* Hanson, M., 9:1807
**Trahern, C.G.,** *See* Chen, A., 9:3736
**Trajmar, S.,** *See* Cartwright, D.C., 9:3549
**Tran, D.Q.,** *See* Johnson, J.L., 9:1780
**Tratz, A.,** Interference factors in digoxin analysis, especially in the serum of pregnant women, by RIA. Clinical aspects, methods, comparative studies using different RIA techniques, 9:3359 (R;DE;In German)
**Trautmann, N.,** *See* Frekers, D., 9:3893
**Treacy, P.B.,** Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3513 (R;AU)
**Treer, T.,** Tangential moving (pendel) technique in postoperative irradiation of breast cancer, 9:3371 (RA;HU;In Hungarian, English)
**Trego, A.L.,** *See* Burke, R.J., 9:4160
**Trettenero, S.,** *See* Abey, A.E., 9:3443
**Trilling, G.H.,** *See* Jaros, J.A., 9:3724
**Trine, J.,** *See* Klein, M., 9:1960
**Tripp, R.D.,** *See* Carr, J., 9:3735
**Tromp, J.W.,** *See* Miller, W.H., 9:2920
**Troshin, S.M.,** Energy dependence of spin-spin correlation parameters in large-angle pp scattering, 9:3758 (R;SU;In Russian)
**True, W.W.,** *See* Ullmann, J.L., 9:3917

**Truhlar, D.G.,** Accurate calculations of the rate constants and kinetic isotope effects for tritium-substituted analogues of the H + $H_2$ reaction, 9:2937 (J;US)
*See* Blais, N.C., 9:2959
*See* Garrett, B.C., 9:2949
*See* Schwenke, D.W., 9:3594
**Tryk, D.,** Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983, 9:2529 (R;US)
**Tsai, H.C.,** *See* Liu, Y.Y., 9:2258
**Tsai, M.C.,** Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100), 9:2967 (J;US)
**Tsai, Y.S.,** Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3714 (R;US)
**Tsallis, C.,** *See* Curado, E.M.F., 9:3525
**Tsang, K.T.,** Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability, 9:4113 (J;US)
**Tsoupas, N.,** *See* Gai, M., 9:3934
**Tsuji, Hirokazu,** Development of an apparatus for testing fatigue of metals at elevated temperatures in controlled environments, 9:3099 (R;JP;In Japanese)
**Tsunoda, R.T.,** *See* Rino, C.L., 9:3502
**Tsurutani, B.T.,** *See* Baker, D.N., 9:3508
**Tsushima, A.,** *See* Amagishi, Y., 9:4065
**Tsuzuki, Tetsuya,** *See* Mohri, Akihiro, 9:4074
**Tuccio, S.,** *See* Bigeleisen, J., 9:2069
**Tully, J.A.,** *See* Gordon, H., 9:4042
**Tundo, P.,** *See* Kurihara, K., 9:3016
**Tunturi, P.J.,** *See* Maekipaeae, M., 9:2658
**Tuominen, J.,** Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations, 9:2225 (RA;XA)
**Tuominen, M.,** *See* Soeyrilae, P., 9:2657
**Tupper, R.B.,** *See* Miller, R.L., 9:4184
**Turcotte, R.P.,** Radiation damage in nuclear waste ceramics, 9:2794 (J;US)
**Turkot, F.,** *See* Cooper, W., 9:3129
**Turner, A.D.,** Electrical processes for the treatment of medium-active liquid wastes. Annual progress report, January-December 1982, 9:1945 (R;GB)
**Turner, C.M.,** *See* Maddox, W.L., 9:2895
**Turner, D.A.,** *See* Rayudu, G.V.S., 9:3047
**Turner, L.,** *See* Baker, C., 9:4219
**Turner, M.F.,** *See* Wesson, J.A., 9:4043
**Turner, P.S.,** Reflection and refraction imaging of oxide surfaces in TEM and STEM, 9:2804 (J;US)
**Turner, R.F.,** Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant, 9:2320 (J;US)
**Turner, W.C.,** Control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 9:4198 (R;US)
**Turner, W.D.,** Thermal systems for conversion of municipal solid waste. Volume 2. Mass burning of solid waste in large-scale combustors: a technology status report, 9:2659 (R;US)
**Turski, R.B.,** Post-initiating phase neutronics analysis of an unprotected LOF event in CRBR, 9:2467 (J;US)
**Tuttle Hart, T.,** *See* Rainer, F., 9:2747
**Tweedie, J.R.,** Origin of uranium and other metal concentrations in the Helmsdale granite and the Devonian sediments of the north-east of Scotland, 9:1912 (B;GB)
**Tychojkij, J.,** IRAM toward standardization in the nuclear field, 9:2490 (J;US)
**Tycko, R.,** Broadband population inversion, 9:4030 (J;US)
*See* Baum, J., 9:4023
**Tylee, J.L.,** Real-time nonlinear estimation of fuel-clad gap conductance, 9:2341 (J;US)
**Tyndall, R.L.,** *See* Orrison, L.H., 9:3386
**Tyurin, N.E.,** *See* Troshin, S.M., 9:3758
**Tyutyunnikov, S.I.,** *See* Aleksandrov, V.S., 9:3138
**Tzou, A.,** *See* Thomson, S.J., 9:1806

## U

**Uberoi, C.,** *See* Reyes, J., 9:2694
**Uchida, K.,** *See* Nagaki, H., 9:2029
**Uchikawa, S.,** *See* Aoyama, M., 9:2214
**Uchikawa, T.,** *See* Watanabe, K., 9:3096
**Ueken, T.,** Scanning microwave interferometer for ELMO bumpy torus, 9:4104 (J;US)
**Ugolini, F.C.,** Dynamics of soil-forming processes in the Arctic, 9:3287 (BA;CA)
**Uldrich, E.D.,** *See* Deis, G.A., 9:4158
**Ullmann, J.L.,** Excitation of the isoscalar giant quadrupole resonance in $^{118}Sn(\pi^{+-},\pi^{+-\prime})$, 9:3917 (J;US)
*See* Castaneda, C.M., 9:3894
**Ullmann, W.,** Comparison of testing methods for particulate filters, 9:3120 (RA;XA)
**Underwood, D.,** *See* Smith, R., 9:3077
**Unger, H.,** *See* Hoecker, K.H., 9:2540
**Untermyer, S.,** *See* Wilczedk, S.W. Jr., 9:2347
**Ure, J.E.,** *See* Anda, E.V., 9:3985
*See* Majlis, N., 9:3984
**Uschkoreit, J.,** Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3042 (R;DE;In German)
**Usenius, A.,** Energy research in the mechanical forest industry 1980-1982. Summary, 9:2656 (R;FI;In Finnish)
**Ushakov, P.A.,** *See* Bogoslovskaya, G.P., 9:2260
**Usher, J.L.,** *See* Yu, W.S., 9:4235
**Uwaha, M.,** Quantum nucleation of solids, 9:3612 (J;US)

## V

**Vadon, G.,** *See* Konya, A., 9:3364
**Valane, R.F.,** *See* Jansky, J.H., 9:1811
**Valdez, J.G.,** *See* Gurley, L.R., 9:3354
**Valencia, F.A.,** *See* Newkirk, L.R., 9:2812
**Valeo, E.J.,** *See* Kulsrud, R.M., 9:4134
**Vallor, R.,** *See* Buvet, R., 9:2966
**van der Kaa, Th.,** *See* Hobson, D.O., 9:2751
**van Doremalen, J.C.H.,** *See* Bozoian, M., 9:3668
**van Driel, M.A.,** Linearity and resolution of photodiodes, 9:3200 (R;US)
**Van Hecke, H.,** *See* Chen, A., 9:3736
**Van Hoesen, S.D.,** *See* Schuresko, D.D., 9:3269
**Van Hove, M.A.,** Efficient scheme for calculation of low-energy electron-diffraction intensities in the presence of large superlattices, with application to the structural analysis of benzene adsorbed on Rh(111), 9:2862 (J;US)
**van Koppen, P.A.M.,** *See* Jarrold, M.F., 9:3583
**van List, V.A.J.,** *See* Erler, J.W., 9:3501
**van Oers, W.T.H.,** Symmetries and the N-N interaction, 9:3820 (R;CA)
**van Rooyen, D.,** *See* Bandy, R., 9:2221
**Van Seiver, S.W.,** *See* Sviatoslavsky, I.N., 9:4225
**Van Tuyle, G.J.,** A momentum integral network method for thermal-hydraulic transient analysis, 9:2470 (J;US)
**van Veen, N.,** Adiabatic and diabatic reactions of $S(^1D)$ atoms with OCS: Internal state distribution of the $S_2$ products, 9:2921 (J;US)
**Van Veld, P.A.,** *See* Spain, U.C., 9:3385
**van Willigen, H.,** Structure of $^{4}VO(H_2O)_5^{2+}$ in cross-linked poly(vinyl alcohol), 9:2786 (J;US)
*See* Chandrashekar, T.K., 9:2073
*See* Kirste, B., 9:2962
**Van Winkle, W.,** *See* Newbold, J.D., 9:3330
**van Zelst, L.,** *See* Bishop, R.L., 9:2889, 9:4237
**Vanasse, R.E.,** *See* Warman, E.A., 9:2486
**Vandoorne, B.,** Deep sea drilling: extension of the dynamic positioning capacity by means of the long base, 9:1831 (BA;GB)
**Vangeel, J.,** *See* Voorde, N. van de, 9:1955
**Vanier, P.E.,** *See* Rajeswaran, G., 9:2837
**Vanka, S.P.,** Fully coupled calculation of fluid flows with limited use of computer storage, 9:3603 (R;US)
**Vannucci, F.,** Neutrino oscillations at CERN, 9:3619 (RA;XC)
**Varacalle, D.J. Jr.,** Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2411 (R;US)
**Varga, G.,** Double contrast method - why is it to be used only at every colon examination, and not at the stomach, 9:3367 (RA;HU;In Hungarian, English)
**Varljen, T.C.,** DTHR and CTHR: A review of two recent tokamak fusion-fission hybrid reactor design studies, 9:4215 (BA;XA)
Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant, 9:4209 (BA;XA)
Progress in engineering simulation testing of fusion reactor first wall components, 9:4220 (BA;XA)
**Varnado, G.B.,** Fault tree analysis using modular logic models, 9:2499 (BA;US)
**Varsik, J.D.,** An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2237 (J;US)
**Vary, J.P.,** *See* Smith, A.R., 9:3885
**Vasil'ev, V.I.,** *See* Belyakov, V.A., 9:4187

**Vasseur, B.,** Operation of the special equipment installed on the dynamic stationing vessel Petrel, 9:1833 (BA;GB)
**Vastola, F.J.,** Laser micropyrolysis of coal macerals. Final report Oct 79-Mar 83, 9:1778 (R;US)
**Vaughn, J.M.,** *See* Landry, E.F., 9:3425
**Vaurio, J.K.,** Availability analysis of standby safety systems, 9:2507 (BA;US)
Practical availability analysis of standby systems, 9:2321 (J;US)
Structures for common-cause failure analysis, 9:2506 (BA;US)
**Vazek, J.,** *See* Gehre, G., 9:2213
**Vedrenne, J.P.,** Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding, 9:1899 (BA;GB)
*See* Le Bihan, 9:1866
**Veith, R.D.,** Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area, 9:3299 (RA;US)
**Vejmelka, P.,** Treatment of concentrated waste for storage and disposal, 9:1986 (R;DE)
**Venhuizen, J.R.,** PWR small-break analysis using a PDP-11/AD-10 computer system, 9:2465 (J;US)
**Vercimak, C.L.,** *See* Linford, G.J., 9:4232
**Verheugen, J.H.N.,** *See* Linde, A. van der, 9:2224
**Vernaz, E.,** *See* Jacquet-Francillon, N., 9:1952
**Vernet, W.G.,** A responsive and effective breeder reactor engineering curriculum, 9:2291 (J;US)
**Vernetson, W.G.,** *See* Diaz, N.J., 9:2485
**Vertes, A.,** Quasifree electron mobility by the method of partial waves in liquid hydrocarbons and in fluid argon, 9:2838 (J;US)
**Viano, J.B.,** *See* Cassagnou, Y., 9:3875
**Vicale, T.J.,** *See* Landry, E.F., 9:3425
**Vickis, A.C.,** Photochemical abatement of radioactive iodines, 9:1970 (RA;CA)
**Vickrey, J.F.,** Morphology of plasma density irregularities in the auroral f-region. Technical report, 9:3499 (J;US)
*See* Rino, C.L., 9:3502
**Victor, G.A.,** Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3598 (J;US)
**Vieira, W.J.,** Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method, 9:3206 (B;BR;In Portuguese)
**Vieria, D.J.,** *See* Bunker, M.E., 9:3901
**Vieth, D.L.,** High-level waste disposal, 9:2019 (J;US)
**Vijayan, S.,** *See* McLean, D.R., 9:1911
**Viktorov, Yu.B.,** Magnetic field formation at the electron ring extraction from the collective accelerator model, 9:3141 (R;SU;In Russian)
Specificities of magnetic field formation in the adgezator of a collective accelerator model, 9:3140 (R;SU;In Russian)
**Villari, A.C.C.,** *See* Hussein, M.S., 9:3948
**Vining, C.B.,** Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_2Si_2$, 9:2861 (J;US)
**Vinitskij, S.I.,** *See* Bakalov, D.D., 9:3639
**Viola, V.E.,** *See* Breuer, H., 9:3897
**Violet, C.E.,** Metastable phase separation in Au-Fe alloys, 9:2720 (J;US)
**Viscido, L.,** *See* Heras, J.M., 9:2698
**Viswanathan, R.,** *See* Welch, D.O., 9:2866
**Vo-Dinh, T.,** *See* Schuresko, D.D., 9:3269
**Voelz, G.L.,** *See* Acquavella, J.F., 9:3395
**Vogel, P.,** *See* Boehm, F., 9:3710
**Vogt, K.J.,** *See* Brenk, H.D., 9:3302
**Volant, C.,** *See* Cassagnou, Y., 9:3875
**Vollhardt, K.P.,** Synthesis, structure, and photochemistry of tetracarbonyl(fulvalene)diruthenium. Thermally reversible photoisomerization involving carbon-carbon bond activation at a dimetal center, 9:3021 (J;US)
**Volman de Tanis, S.,** Certification and qualification of suppliers and personnel for the Argentine nuclear program, 9:2313 (J;US)
**von der Hardt, P.,** Petten activities in the RERTR field, 9:2367 (RA;US)
**Vonach, H.K.,** *See* Blann, M., 9:3930
**Vondy, D.R.,** Solving the uncommon nuclear reactor core neutronics problems, 9:2331 (J;US)
**Voorde, N. van de,** High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium, 9:1955 (R;XE)
**Vorob'ev, A.P.,** *See* Azhinenko, I.V., 9:3629
**Voronov, N.A.,** *See* Belova, T.I., 9:3838
**Voronov, V.V.,** Two-quasiparticle strength distributions in $^{62}$Ni and $^{206}$Pb, 9:3900 (R;SU)
**Voros, A.,** Sturm-Liouville spectrum problem: quartic oscillator case, 9:4002 (R;FR;In French)
**Voznyakevich, E.V.,** Method for determining the mass of stagnant liquid during an infinite rod fuel assembly flowing round, 9:2333 (R;SU;In Russian)
**Vujisic, L.,** Airborne radioactivities in the gas cooling and ventilation systems of the research reactor RA-Vinca, 9:2384 (RA;XA)
**Vulcan, W.F.,** *See* Hertzog, D.W., 9:3721
**Vulliet, W.G.,** *See* Erler, J.W., 9:3501
**Vysotsky, M.I.,** *See* Eides, M.I., 9:3839

## W

**Wackerle, J.,** *See* Anderson, A.B., 9:3228
**Wada, N.,** *See* Kamitakahara, W.A., 9:2785
**Wada, Y.,** Mechanism of piezo - and pyroelectricity of poly (vinylidene fluoride) electret, 9:3990 (RA;BR)
**Waddington, J.G.,** Fault tree as a tool in safety analysis of nuclear power plants, 9:2426 (RA;CA)
**Wadkins, R.P.,** *See* Deis, G.A., 9:4158
**Wadsworth, A.L. III,** *See* Walther, J.F., 9:2525
**Wadt, W.R.,** *See* Engelke, R., 9:2980
**Wager, J.F.,** Estimation of the band gap of $InPO_4$, 9:2868 (J;US)
**Wagner, A.F.,** Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. II. Theory, 9:1925 (J;US)
*See* Garrett, B.C., 9:2949
**Wagner, J.S.,** *See* Sydora, R.D., 9:4107
**Wagner, W.,** *See* Averback, R.S., 9:2725
**Wahid, P.,** *See* Gandhi, O.P., 9:3429
**Wakatani, M.,** *See* Hasegawa, A., 9:4106
**Wakayama, M.,** *See* Sawamura, O., 9:2424
**Wakayama, N.,** Development on experimental VHTR instrumentation, 9:2386 (R;XA)
**Wald, J.W.,** *See* Turcotte, R.P., 9:2794
**Walecka, J.D.,** Muon capture in nuclei, 9:3870 (RA;US)
Neutrino interactions with nuclei, 9:3681 (RA;US)
Nuclear physics experiments using muons, 9:3871 (RA;US)
*See* Heffner, R.H., 9:3711
**Walker, H.W.,** Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2961 (J;US)
**Walker, J.S.,** *See* Caflisch, R.G., 9:2859
**Walker, R.B.,** *See* Bowman, J.M., 9:2922
**Walker, R.L.,** Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2288 (R;US)
**Wall, J.E.,** *See* Harvey, C.A., 9:2568
**Wallace, E.,** *See* Smith, R., 9:3077
**Wallace, R.M.,** *See* Schultz, W.W., 9:2892
**Wallace, T.C. Sr.,** *See* Newkirk, L.R., 9:2812
**Wallis, L.R.,** Education-prerequisite to adequate technology transfer, 9:2480 (J;US)
**Walrafen, G.E.,** *See* Holmes, N.C., 9:3545
**Walsh, F.M.,** Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82, 9:1809 (R;US)
**Waltar, A.E.,** Experience with FBR education in laboratory and short course settings, 9:2290 (J;US)
**Walters, G.K.,** *See* McConnell, R.P., 9:2719
**Walther, J.F.,** Study to establish cost projections for production of redox chemicals, 9:2525 (R;US)
**Walton, L.A.,** High-reliability PWR fuel, 9:2232 (J;US)
**Walton, O.R.,** Granular flow considerations in the design of a cascade solid breeder reaction chamber, 9:4194 (R;US)
**Waltz, R.E.,** Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4096 (J;US)
**Wan, P.T.,** Actinide transmutation with a $UF_6$ reactor, 9:2032 (J;US)
**Wands, R.,** Design of an indirectly cooled 3-m diameter superconducting solenoid with external support cylinder for the Fermilab Collider Detector Facility, 9:3079 (J;US)
**Wang, C.H.,** *See* Gandhi, O.P., 9:3429
**Wang, C.Y.,** *See* Seidensticker, R.W., 9:2302
**Wang, D.,** Effects of continental slope on the mean shelf circulation, 9:3446 (J;US)

**Wang, D.P.,** Effects of continental slope on the mean shelf circulation, 9:3447 (J;US)
**Wang, E.,** *See* Ball, R.C., 9:3733
**Wang, H.T.,** *See* Chen, Y.W., 9:2087
**Wang, J.C.,** Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^o$ deexcitation measurements in a plasma, 9:3571 (J;US)
**Wang, K.C.,** Possible neutrino beams, fluxes, and rates at LAMPF II, 9:3153 (RA;US)
*See* Allen, R.C., 9:3684
**Wang, K.L.,** New vacuum structure, background strength and confinement, 9:3754 (R;XA)
**Wang, T.S.,** Electron detachment for $H^-$ ($D^-$) in collisions with Ne, 9:3555 (J;US)
**Wang, X.F.,** *See* Huang, H.W., 9:3218
**Warburton, E.K.,** *See* Dybdal, K., 9:3932
**Warden, J.T.,** *See* Acocella, J., 9:2876
**Ware, A.G.,** *See* Deis, G.A., 9:4158
**Warman, E.A.,** An assessment of the radiological consequences of postulated reactor accidents, 9:2486 (J;US)
**Warner, D.D.,** Predictions of the interacting boson approximation in a consistent Q framework, 9:3956 (J;US)
**Warner, R.A.,** *See* Reeder, P.L., 9:3916
**Warshawsky, D.,** Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3410 (R;US)
**Wartmann, R.,** *See* Hoecker, K.H., 9:2540
**Wasielewski, M.R.,** *See* Overfield, R.E., 9:3017
**Watanabe, Hitoshi,** *See* Ohno, Hideo, 9:2828
**Watanabe, K.,** Development of acoustic leak detection in a primary cooling system, 9:3096 (RA;CA)
**Watanasiri, S.,** *See* Starling, K.E., 9:1790
**Watari, F.,** *See* Cowley, J.M., 9:3224
**Waterman, T.,** *See* Napadensky, H., 9:3241
**Waterman, T.E.,** Modeling urban fire growth, 9:3245 (RA;US)
**Watson, A.E.,** Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2899 (R;ZA)
**Watson, E.B.,** *See* Acocella, J., 9:2876
**Watson, J.W.,** Ecological study of the American rough-legged hawk on the Idaho National Engineering Laboratory, 9:3323 (RA;US)
Raptor electrocutions on the Idaho National Engineering Laboratory, 9:3432 (RA;US)
**Watterson, I.A.,** *See* Skog, K.E., 9:2093
**Way, J.D.,** Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83, 9:1880 (R;US)
**Weart, W.D.,** WIPP: the solution to disposal of defense transuranic waste, 9:2036 (J;US)
**Weaver, J.H.,** *See* Peterman, D.J., 9:2791
**Weber, H.J.,** *See* Bozoian, M., 9:3668
**Weber, H.W.,** *See* Sauerzopf, F.M., 9:4001
**Weber, P.G.,** High-intensity lithium-ion source, 9:3159 (J;US)
Plasma spectral analysis using an image dissecting detector, 9:4103 (J;US)
**Webster, R.D.,** Addition of coal mining regulations to the Computer-Aided Environmental Legislative Data System (CELDS). Final report, 9:1818 (R;US)
**Wedepohl, A.,** *See* Smith, D.J., 9:3116
**Wehe, D.K.,** RERTR demonstration experiments program at the Ford Nuclear Reactor, 9:2374 (RA;US)
**Weidlich, B.,** Building laws and regulations and the utilization of solar energy in the Federal Republic of Germany, 9:2103 (RA;DE;In German)
**Weidman, T.W.,** *See* Vollhardt, K.P., 9:3021
**Weiland, J.,** *See* Rahman, H.U., 9:4126
**Weiland, T.,** Transverse beam cavity interaction. Pt. 2, 9:3136 (R;DE)
**Weingaertner, R.,** *See* Baars, H.G., 9:3362
**Weinstein, A.,** *See* Edwards, C., 9:3728
**Weise, L.,** Neutron spectra unfolding from measured detector activations, 9:3192 (R;DE;In German)
**Weisenburger, S.,** Off-gas treatment for HLLW-vitrification techniques using a liquid-fed ceramic waste glass melter, 9:1961 (RA;XA)
**Weiss, L.,** *See* Parker, S., 9:2090
**Weitekamp, D.P.,** *See* Garbow, J.R., 9:2905
**Welch, D.O.,** Relationship between the electronic density of states and the superconducting critical temperature of disordered $V_3Si$, 9:2866 (J;US)
*See* Suenaga, M., 9:2768
**Weldon, H.A.,** Simple rules for discontinuities in finite-temperature field theory, 9:3848 (J;US)
**Weller, H.R.,** *See* King, S.E., 9:3873
**Weller, S.W.,** Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1763 (R;US)
**Wells, P.B.,** Molten salt thermal energy storage subsystem for solar thermal central receiver plants, 9:2152 (R;US)
**Welsh, R.E.,** Sigma-minus hydrogenic atoms, 9:3653 (RA;US)
*See* Hertzog, D.W., 9:3721
*See* Kunselman, R., 9:3702
**Wender, I.,** *See* Albal, R., 9:1768
**Wender, S.A.,** Bismuth germanate as a high-energy gamma-ray detector, 9:3205 (J;US)
**Wenzel, R.G.,** *See* Druehl, K., 9:3564
**Wepener, J.H.,** Atomic-absorption programme for the Apple 2 plus computer, 9:3213 (R;ZA)
**Werbik, C.,** *See* Hick, H., 9:3100
**Wermann, H.,** *See* Baars, H.G., 9:3362
**Werner, J.,** *See* Moeller, L., 9:3267
**Werner, J.R.,** *See* Hoehne, J.L., 9:2668
**Wert, J.J.,** *See* Carpenter, R.W., 9:2767
**Werthen, J.G.,** Effects of surface preparation on the properties of metal/CdTe junctions, 9:2849 (J;US)
**Wescott, E.M.,** *See* Sydora, R.D., 9:4107
**Wesson, J.A.,** Tokamak disruptions, 9:4043 (R;GB)
**West, C.D.,** Stirling engines with controlled evaporation of a two-phase two-component working fluid, 9:2670 (R;US)
**West, W.P.,** Observation of the asymmetric O—U—O stretch in the vibronic absorption spectrum of uranyl formate monohydrate, 9:3046 (J;US)
**Westlake, D.G.,** Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD$/sub x/. II. Application of a geometric model, 9:2716 (J;US)
**Westmacott, K.H.,** *See* Thomas, G., 9:3225
**Weston, R.E. Jr.,** *See* Chu, J.O., 9:3592
**Wetzel, R.G.,** *See* Crumpton, W.G., 9:3329
**Wexler, S.,** Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. I. Experiment, 9:3448 (J;US)
**Weyers, C.,** *See* Klein, M., 9:1960
**Whaley, T.W.,** *See* Okinaka, R.T., 9:3417
**Wharton, W.R.,** *See* Barnes, P.D., 9:3877
**Wheelwright, E.J.,** *See* Schultz, W.W., 9:2892
**Whelan, D.J.,** 'Exporting' the Canadian licensing program, 9:2307 (RA;CA)
**Whelan, J.A.,** *See* Danti, K., 9:2155
**Whelan, M.P.,** Synthesis and ion exchange properties of grafted poly(p-phenylene terephthalamide), 9:1920 (B;ZA)
**Whiste, R.H.,** *See* Schmid, J.P., 9:1799
**Whicker, F.W.,** Radioecology: nuclear energy and the environment, 9:3306 (B;US)
*See* Kuzo, G.B., 9:3335
**White, A.B. Jr.,** Numerical solution of initial/boundary-value problems in one space dimension, 9:4255 (J;US)
**White, C.L.,** Sulfur and phosphorus segregation to creep cavities and grain boundaries in 304 SS, 9:2760 (J;US)
**White, C.W.,** *See* Dutta, S., 9:2872
*See* Narayan, J., 9:2882
*See* Stritzker, B., 9:2750
**White, D.,** *See* Hirst, E., 9:2628
**White, M.G.,** Inner-valence shell photoionization of $Ar_3$, $Ar_3$, $Kr_3$, and $Kr_3$, 9:3554 (J;US)
**White, R.B.,** Theory of mode-induced beam particle loss in tokamaks, 9:4117 (J;US)
**White, S.D.M.,** *See* Frenk, C.S., 9:3484
**Whitehead, N.E.,** Geothermal remnant activity at Ngawha 1981, 9:2157 (R;NZ)
Ngawha track etch survey 1981. Preliminary results, 9:2166 (R;NZ)
**Whitham, K.,** Design and construction of large capacitor banks, 9:4195 (R;US)
**Whitlock, P.A.,** Schwinger variational method for the Bloch equation, 9:4031 (J;US)
**Whitten, D.G.,** Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983, 9:3006 (R;US)
*See* Chandrasekaran, K., 9:3028
*See* Hui, Y., 9:2997
*See* Schanze, K.S., 9:3009
**Whyley, R.J.,** *See* Hertzog, D.W., 9:3721
**Wiebe, P.,** *See* Wight, A.L., 9:2264
**Wieczorek, H.,** Acid digestion of Pu-containing waste. Process development and Pu-recovery, 9:1951 (R;XE;In German)
Treatment of Pu-containing waste by acid digestion (wet combustion), 9:1983 (R;DE)
**Wiedersich, H.,** *See* Averback, R.S., 9:2725
**Wieland, B.,** *See* Ferrieri, R.A., 9:3050

**Wiencek, T.C.,** *See* Domagala, R.F., 9:2357
**Wiese, H.,** Experience with the storage of high active waste at WAK, 9:1946 (R;DE)
**Wiese, H.W.,** *See* Fischer, U., 9:1938
**Wieser, E.,** Flash lamp annealing of ion implanted boron profiles, 9:2832 (R;AT;In German)
**Wieske, P.,** Underwater storage tank system: a new conception for the storage of oil and methanol, 9:1870 (BA;GB)
**Wiggins, K.,** *See* Smith, R., 9:3077
**Wight, A.L.,** Simulation of Darlington fuelling with SIMODEX, a fuel management program based on modal expansion method, 9:2264 (RA;CA)
**Wilbur, D.S.,** Regiospecific incorporation of radioiodine into aromatic rings via organosilanes, 9:3048 (J;GB)
**Wilcke, W.W.,** *See* Breuer, H., 9:3897
**Wilczedk, S.W. Jr.,** Results of the poolside nondestructive examination of irradiated control blades removed from BWRs, 9:2347 (J;US)
**Wild, A.,** *See* Waddington, J.G., 9:2426
**Wild, E.,** *See* Chalupka, A., 9:3858
**Wilets, L.,** Dynamics of the soliton bag, 9:3741 (R;US)
**Wilgen, J.B.,** *See* Hiroe, S., 9:4082
*See* Kulchar, A.G., 9:4079
**Wilhelm, J.G.,** *See* Ruedinger, V., 9:3119
**Wilkinson, G.S.,** *See* Acquavella, J.F., 9:3395
**Wilkoxz, R.J.,** Idaho National Engineering Laboratory vegetation data file, 9:3309 (RA;US)
**Willatt, B.M.,** *See* Hucknall, D.J., 9:1905
**Williams, A.H.,** *See* Tan, T.H., 9:3257
**Williams, D.C.,** Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1762 (R;US)
**Williams, E.A.,** *See* Simon, A., 9:4122
**Williams, G.,** *See* Kramer, R., 9:3979
**Williams, J.C.,** *See* Hwang, M., 9:2684
**Williams, J.E.C.,** *See* Cohn, D.R., 9:4207
**Williams, J.M.,** Role of monovalent anions in organic superconductors, 9:2819 (J;US)
*See* Burch, R.R., 9:2988
**Williams, L.M.,** Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2783 (J;US)
**Williams, M.D.,** *See* Schilling, G., 9:4145
**Willis, J.O.,** *See* Taylor, R.D., 9:2745
**Willoughby, A.B.,** DIRECT COURSE industrial hardening experiment and predictions, 9:3252 (RA;US)
**Wilmsen, C.W.,** *See* Wager, J.F., 9:2868
**Wilson, B.W.,** Heteroatomic polycyclic aromatic hydrocarbons in coal liquids, 9:1817 (R;US)
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3420 (R;US)
**Wilson, J.R.,** *See* Bethe, H.A., 9:3960
*See* Bowers, R., 9:3493
**Wilson, K.L.,** Critical plasma-materials issues for fusion reactor designs, 9:4223 (BA;XA)
**Wilson, K.R.,** *See* Reimers, J.R., 9:3553
**Wilson, T.M.,** *See* Summers, G.P., 9:2793
**Wimmer, E.,** All-electron local-density theory of alkali-metal bonding on transition-metal surfaces: Cs on W(001), 9:2723 (J;US)
**Windgassen, K.F.,** Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen, 9:2756 (TG;US)
**Winkler, M.H.,** Comments on applications of reduced enrichment fuels, 9:2378 (RA;US)
**Winter, B.M.,** Evaluating the effects of a prescribed burn on the foraging ecology of sage and Brewer's sparrows, 9:3312 (RA;US)
**Winter, H.,** Calculation of self-consistent potentials for substitutionally disordered systems with application to the Ag/sub x/-Pd/sub 1-x/ alloy series, 9:2737 (J;US)
**Winter, R.G.,** *See* Hertzog, D.W., 9:3721
**Wire, G.L.,** *See* Puigh, R.J., 9:2285
**Wiringa, R.B.,** *See* Friman, B.L., 9:3958
**Wiscombe, W.,** *See* Hoffert, M.I., 9:3261
**Witebsky, C.,** *See* Smoot, G.F., 9:3477
**Wobschall, D.C.,** *See* Pitsakis, M.N., 9:3217
**Woellenweber, H.D.,** *See* Baars, H.G., 9:3362
**Woerth, S.C.,** *See* Grush, W.H., 9:2408
**Wohn, F.K.,** Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A~100 region, 9:3918 (J;US)
**Wolski, E.R.,** Model to simulate the dynamic of a PWR pressurizer using the CSMP program, 9:2242 (B;BR;In Portuguese)
**Wolf, A.P.,** *See* Ferrieri, R.A., 9:3050, 9:3051
*See* Shiue, C., 9:3049
*See* Zhou, Y.G., 9:3052
**Wolf, K.L.,** *See* Breuer, H., 9:3897
**Wolfe, D.,** Search for mesons in the mass range 2.5 to 5 GeV/$c^2$, 9:3664 (RA;US)
**Wolgemuth, G.A.,** *See* Scott, D.A., 9:2265
**Wong, C.P.C.,** *See* Hopkins, G.R., 9:4217
**Wong, H.V.,** *See* Berk, H.L., 9:4135
**Wong, K.L.,** Echo phenomenon associated with lower-hybrid wave launching, 9:4116 (J;US)
**Wong, R.,** *See* Palen, A.H., 9:2428
**Wood, J.L.,** Nuclear structure from radioactive decay. Annual progress report, 9:3922 (R;US)
**Wood, L.L.,** *See* McWilliams, B.M., 9:3109
**Wood, R.A.,** *See* Romney, E.M., 9:3304
**Wood, R.F.,** *See* Jellison, G.E. Jr., 9:2855
**Wood, R.H.,** Comparison of experimental values of anti V°$_2$, anti C/sub P/°$_2$, and anti C/sub V/°$_2$ for aqueous NaCl with predictions using the born equation at temperatures from 300 to 573.15 K at 17.7 MPa, 9:2941 (J;US)
**Woodis, A.,** Data Base Management Project. Annual report, 29 September 1982-29 September 1983, 9:2315 (R;US)
**Woodle, K.A.,** *See* Howell, R.H., 9:3132
**Woodley, R.E.,** Characteristics of spent LWR fuel relevant to its storage in geologic repositories, 9:1928 (R;US)
**Woods, J.E.,** *See* Janssen, J.E., 9:2636
**Woodson, S.C.,** Tests and analyses of 1/4-scale upgraded nine-bay reinforced concrete basement models, 9:3063 (RA;US)
**Woodward, A.,** *See* Janssens, J.H., 9:2134
**Woolfenden, W.R.,** *See* Pugmire, R.J., 9:1787
**Woolson, W.A.,** ATR code improvements. Final report 15 Oct-31 Dec 79, 9:3278 (R;US)
**Wootton, L.R.,** *See* Cornuel, P., 9:1838
**Wortman, J.J.,** *See* Narayan, J., 9:2840
**Wright, A.W.,** *See* Levit, S., 9:3954
**Wright, C.R.,** Computer economics of physical coal cleaning and flue gas desulfurization, 9:1804 (R;US)
**Wright, C.W.,** *See* Wilson, B.W., 9:1817, 9:3420
**Wrighton, M.S.,** Chemically derivatized semiconductor photoelectrodes. Interim technical report, 9:2104 (R;US)
*See* Liu, D.K., 9:3003
*See* Stalder, C.J., 9:2923
**Wrona, B.J.,** *See* Newman, L.W., 9:2223
**Wu, M.K.,** *See* Huang, S.Z., 9:2764
**Wu, P.C.,** *See* Gallier, P.W., 9:1767
**Wu, T.T.,** *See* Ruijgrok, T.W., 9:4040
**Wulff, W.,** BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2462 (J;US)
NRC plant-analyzer development at BNL, 9:2403 (R;US)
**Wunderlich, L.H.,** *See* Misiewicz, R., 9:2287
**Wuschke, D.M.,** *See* Dormuth, K.W., 9:1977
**Wynveen, R.A.,** *See* Cooke, R.H., 9:3163

## X

**Xinzhou, L.,** Relation mr << 1 in the preon model, 9:3831 (R;XA)
**Xu, S.Q.,** *See* Miyano, K., 9:2993

## Y

**Yakimenko, I.P.,** *See* Golubinskij, P.K., 9:4075
**Yakupkovic, J.,** *See* Jordan, J., 9:1791
**Yamada, H.T.,** *See* Henke, B.L., 9:4102
**Yamada, Kawakatsu,** Generation of super-fast ions due to nonlinear processes near the quarter critical density in laser-produced plasmas, 9:4061 (R;JP)
**Yamada, M.,** Experimental investigation of the spheromak configuration, 9:4226 (BA;XA)
**Yamada, R.,** *See* Wands, R., 9:3079
**Yamagishi, H.,** *See* Wakayama, N., 9:2386
**Yamaguchi, Sadae,** Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3968 (R;JP)
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4171 (RA;JP;In Japanese)
**Yamaguchi, Seiya,** Bremsstrahlung energy loss of degenerate plasma, 9:4170 (R;JP)

**Yamaguchi, Y.,** Molecular clustering about a positive ion. Structures, energetics, and vibrational frequencies of the protonated hydrogen clusters $H^+_3$, $H^+_5$, $H^+_7$, and $H^+_9$, 9:3586 (J;US)
**Yamamoto, H.,** *See* Yoshida, Y., 9:2385
**Yamanaka, C.,** *See* Iso, Y., 9:4205
**Yamanouti, Yoshimaro,** *See* Takahashi, Hideaki, 9:3149
**Yamashita, Yoshioki,** *See* Ishikawa, Makoto, 9:2395
**Yamauchi, Isamu,** *See* Matsumoto, Masakatsu, 9:3098
**Yamazaki, T.,** Search for exotics in two-body decay of $K^+$: K/sub $\mu_2$/ and K/sub $\pi_2$/ revisited, 9:3693 (RA;US)
**Yampolsky, J.S.,** Tubing for augmented heat transfer, 9:2653 (R;US)
**Yanagida, T.,** *See* Gelmini, G.B., 9:3810
**Yang, H.Q.,** *See* Qian, Y.J., 9:2746
**Yang, H.T.,** Advanced photovoltaic concentrator cells. Final report, August 29, 1979-March 31, 1982, 9:2128 (R;US)
**Yang, J.J.J.,** *See* Miller, D.L., 9:2129
*See* Yang, H.T., 9:2128
**Yang, T.,** *See* Cohn, D.R., 9:4207
**Yankielowicz, S.,** *See* Frishman, Y., 9:3846
**Yarusso, D.J.,** *See* Pan, H.K., 9:2979
**Yavuzkurt, S.,** Fluidized combustion of oil shale. Final report, 9:1910 (R;US)
**Yeager, E.,** *See* Tryk, D., 9:2529
**Yeh, T.R.,** *See* Clark, D.D., 9:3905
**Yeivin, Y.,** Euracos activation experiments: preliminary uncertainty analysis, 9:2903 (R;US)
**Yen, Y.,** Multiple-quantum NMR in solids, 9:2873 (J;US)
**Yi, X.,** *See* Alam, M.S., 9:3719
**Yip, T.W.G.,** *See* Strehlow, R.A., 9:3057
**Yntema, J.L.,** *See* Frekers, D., 9:3893
**Yochmowitz, M.G.,** *See* Cordts, R.E., 9:3391
**Yokosawa, A.,** *See* Bhatia, T.S., 9:3671
**Yokota, Toshiaki,** *See* Furukane, Utaro, 9:4063
**Yonas, G.,** Inertial fusion research based on pulsed power, 9:4227 (BA;XA)
**Yoon, E.S.,** *See* Gallier, P.W., 9:1767
**Yoshida, Hiroshi,** *See* Ohno, Hideo, 9:2828
**Yoshida, Kazuo,** *See* Fujiki, Kazuo, 9:2439
**Yoshida, T.,** *See* Tasaka, K., 9:3915
**Yoshida, Y.,** Experiences in radioactive gaseous effluent management in JAERI, 9:2385 (RA;XA)
**Yoshioka, Y.,** *See* Hoffman, M.R., 9:2996
**Yoshizawa, H.,** Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2847 (J;US)
*See* Hagen, M., 9:2860
**Young, A.B.A.,** *See* Joyce, D.C., 9:3730
**Young, C.,** Simulation and evaluation of explosive/propellant stimulation treatments, 9:1891 (RA;US)
**Young, C.E.,** *See* Wexler, S., 9:3448
**Young, D.R.,** *See* Rau, G.H., 9:3328
**Young, D.T.,** Energy distributions and yields of secondary ions and electrons emitted by GIOTTO during Halley encounter, 9:3456 (R;US)
**Young, F.C.,** *See* Herbst, M.J., 9:4191
**Young, K.K.,** *See* Chaloupka, V., 9:3694, 9:3695
**Youngblood, R.W.,** *See* Moodenbaugh, A.R., 9:2931
**Yu, L.T.,** *See* Buvet, R., 9:2966
**Yu, W.S.,** TRAIL - a tokamak rail gun limiter, 9:4235 (BA;GB)
**Yudin, A.I.,** *See* Bol'shov, L.A., 9:4163
**Yuferov, A.G.,** Construction of Green functions by the additive operator splitting method, 9:4006 (R;SU;In Russian)
**Yukalov, V.I.,** *See* Shumovsky, A.S., 9:4000
**Yurchenko, Eh.I.,** *See* Gribkov, V.M., 9:4059
**Yutlandov, I.A.,** *See* Pokrovskij, V.N., 9:3537

## Z

**Zabel, H.,** Versatile sample chamber for neutron scattering work at high and low temperatures, 9:3202 (J;US)
**Zaccor, J.V.,** *See* Willoughby, A.B., 9:3252
**Zachara, J.M.,** *See* Ugolini, F.C., 9:3287
**Zachariasen, F.,** *See* Carruthers, P., 9:4033
**Zadworny, F.,** *See* Delaunay, M., 9:4231
**Zagiczek, S.,** *See* Hick, H., 9:3100
**Zagorodnij, A.G.,** *See* Golubinskij, P.K., 9:4075
**Zagury, N.,** Hadron spectroscopy, 9:3762 (R;BR;In Portuguese)
**Zahnas, L.,** *See* Kepak, F., 9:1957
**Zajtsev, M.Yu.,** *See* Romanov, V.M., 9:3966
**Zak, B.D.,** *See* McKeon, D., 9:2072
**Zakkay, V.,** Experimental investigation of fuel vaporization on combustion efficiency, 9:2626 (R;US)
**Zaks, A.,** *See* Breit, J.D., 9:3478
**Zaletin, V.M.,** *See* Gajsler, V.A., 9:2830
**Zalewski, E.F.,** *See* Keller, R.A., 9:3600
**Zanevskij, Yu.V.,** *See* Abdushukurov, D.A., 9:3191
**Zangwill, A.,** *See* Colbert, J., 9:2739
**Zani, P.,** *See* Pizzini, S., 9:2137
**Zankl, M.,** *See* Kramer, R., 9:3979
**Zarand, P.,** *See* Hermann, A., 9:3379
**Zarestky, J.,** *See* Stassis, C., 9:2742
**Zarubitskii, O.G.,** Electrolyzer for obtaining and refining metals, 9:2717 (TG;US)
**Zavoshy, S.,** *See* Pigford, T.H., 9:2025
**Zazyulya, F.E.,** *See* Baranov, V.A., 9:3187
**Zehr, S.W.,** *See* Miller, D.L., 9:2129
*See* Yang, H.T., 9:2128
**Zeidler, G.,** Safety problems in connection with offshore process plants, using, as example, a methanol production plant for gas fields, 9:1881 (BA;GB)
**Zeiri, Y.,** *See* Redondo, A., 9:2969
**Zeldes, H.,** Use of spectral simulations for the assay of radical concentrations by ESR, 9:3000 (J;GB)
**Zelenskij, V.F.,** *See* Gann, V.V., 9:2548
**Zeller, M.E.,** Measurement of the decay asymmetry in $\Sigma^+ \rightarrow p\gamma$, 9:3698 (RA;US)
**Zemach, C.,** *See* Menikoff, R., 9:3613
**Zentner, U.,** Reduction of nitrogen monoxide by catalytically activated lignite coke, 9:1798 (R;DE;In German)
**Zerga, D.L.,** *See* Pippin, L.C., 9:1994
**Zero, S.,** *See* Roshd, M., 9:2239
**Zeuch, W.R.,** *See* Seidensticker, R.W., 9:2302
**Zhabitskij, V.M.,** *See* Viktorov, Yu.B., 9:3140
**Zhamkochyan, V.M.,** *See* Gevorkyan, S.R., 9:3742
**Zhang, Z.,** *See* Huisken, F., 9:3022
**Zhelamskij, M.V.,** *See* Dubasov, V.G., 9:4185
**Zheng, J.Q.,** *See* Qian, Y.J., 9:2746
**Zhevago, N.K. Yan Shi,** *See* Avakyan, A.P., 9:3965
**Zhidkov, E.P.,** Symbolic evaluation of some multidimensional integrals by the computer algebraic manipulations, 9:4019 (R;SU;In Russian)
*See* Amirkhanov, I.V., 9:3142
**Zhidkova, I.E.,** *See* Amirkhanov, I.V., 9:3142
**Zhilin, P.A.,** To the calculation of stress-strained state of the discharge chambers of tokamak devices, 9:4189 (R;SU;In Russian)
**Zhou, B.R.,** Family gauge symmetry from a composite model, 9:3791 (J;NL)
**Zhou, M.L.,** *See* Chu, Y.Y., 9:3941
**Zhou, Y.G.,** Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3052 (J;GB)
**Zhukov, A.V.,** *See* Bogoslovskaya, G.P., 9:2260
**Zhukova, T.I.,** *See* Burenkov, A.F., 9:3967
**Zhuravlev, I.P.,** *See* Voronov, V.V., 9:3900
**Zikides, C.,** *See* Chrysochoides, N.G., 9:2380
**Ziks, B.,** *See* Sarmento, E.F., 9:3522
**Zimmerman, P.G.,** *See* Farneth, W.D., 9:3026
**Zinov, V.G.,** *See* Grebenyuk, V.M., 9:3210
**Zlock, H.J.,** *See* Sennhauser, U., 9:3881
**Zipperian, T.E.,** GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications, 9:3110 (J;US)
*See* Fritz, I.J., 9:2845
**Zirin, H.,** *See* Zodi, A.M., 9:3473
**Zitzewitz, A. von,** Development of a radioimmunoassay of tetracycline and its derivatives, 9:3360 (R;DE;In German)
**Zodi, A.M.,** Persistent 1.5s oscillations superimposed at a solar burst observed at two mm-wavelengths, 9:3473 (R;US)
**Zofka, J.,** *See* Majling, L., 9:3650
**Zuber, J.B.,** Complex singularities and distribution of zeros in Ising and gauge models, 9:3825 (R;FR)
**Zunger, A.,** Structural origin of optical bowing in semiconductor alloys p, 9:2865 (J;US)
**Zweifel, P.F.,** *See* Greenberg, W., 9:3976
*See* Larsen, E.W., 9:4130
**Zwicki, R.D.,** *See* Baker, D.N., 9:3508
*See* Bame, S.J., 9:3506
**Zyazyulya, F.E.,** *See* Evtukhovich, P.G., 9:3186

## NOTICE

During the preparation of *ERA*, Volume 9, Number 2, an error was introduced that resulted in the abstract numbers on all entries in the Subject and Contract Number Indexes being six digits too low. The error arose when the initial abstract number 1751 was used instead of the correct number 1757.

I regret the inconvenience to the users of *ERA* and will eliminate the error from our file prior to preparation of the cumulative indexes.

David E. Bost
Editor

# SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms (DOE/TIC-7000). Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

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The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

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## A


**ABDOMEN**
**Computerized Tomography**
Computer tomography of abdominal tumours, 9:3360 (RA;HU;In Hungarian, English)
**ABSORBED DOSES**
*See RADIATION DOSES*
**ABSORPTION SPECTROSCOPY**
**A Codes**
Atomic-absorption programme for the Apple 2 plus computer, 9:3207 (R;ZA)
**ACCELERATORS**
*See also CYCLIC ACCELERATORS*
*HEAVY ION ACCELERATORS*
*LINEAR ACCELERATORS*
**Design**
Advanced medical accelerator design, 9:3129 (J;US)
Factors affecting the operating characteristic of the zetatron: a small neutron generator for borehole logging, 9:3124 (J;US)
**Ion Sources**
High-intensity lithium-ion source, 9:3153 (J;US)
**Radiation Protection**
Radiation safety systems at Brookhaven National Laboratory's low-energy accelerators, 9:3128 (J;US)
**ACCIDENTAL IRRADIATION**
*See RADIATION ACCIDENTS*
**ACCRETION (STARS)**
*See STAR ACCRETION*
**ACCUMULATION (RADIOECOLOGICAL)**
*See RADIOECOLOGICAL CONCENTRATION*
**ACES**
*See QUARKS*
**ACETIC ACID**
**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)
**ACETONITRILE**
**Adsorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Desorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Mass Spectra**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**ACETYLENE**
**Electron Spin Resonance**
Time-domain analysis of EPR measurements of polyacetylene and soliton diffusion, 9:2812 (J;US)
**Electronic Structure**
$^2Pi_+$–X $^2\Sigma^+$ infrared electronic transition of $C_2H$, 9:3576 (J;US)
**Infrared Spectra**
$^2Pi_+$–X $^2\Sigma^+$ infrared electronic transition of $C_2H$, 9:3576 (J;US)
**Ion Emission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
**Photoemission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
**Solitons**
Time-domain analysis of EPR measurements of polyacetylene and soliton diffusion, 9:2812 (J;US)
**Spectroscopy**
Diode laser spectrometry for monitoring acetylene on-line in a liquefaction plant, 9:2889 (R;US)
**Vibrational States**
Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers, 9:2990 (J;US)
**ACETYLENES**
*See ALKYNES*
**ACETYLSALICYLIC ACID**
**Radiosensitivity Effects**
The effect of x rays, DTPA, and aspirin on the absorption of plutonium from the gastrointestinal tract of rats, 9:3396 (J;US)
**ACID RAIN**
**Pollution Regulations**
Economic impact of acid rain legislation on Illinois, 9:2537 (R;US)
**Precursor**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)
**ACIDS (INORGANIC)**
*See INORGANIC ACIDS*
**ACIDS (ORGANIC)**
*See ORGANIC ACIDS*

**ACOUSTIC EMISSION TESTING**
Investigations on the monitoring of structural integrity and fault location for civil engineering prestressed concrete structures by acoustic emission analysis, 9:3094 (R;AT;In German)

**ACRIDINES**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**ACROLEIC ACID**
*See ACRYLIC ACID*

**ACRYLAMIDE**
**Nucleate Boiling**
Nucleate boiling in drag-reducing polymer solutions, 9:3084 (J;US)

**ACRYLIC ACID**
**Nucleate Boiling**
Nucleate boiling in drag-reducing polymer solutions, 9:3084 (J;US)

**ACTINIDES**
*See also AMERICIUM*
*NEPTUNIUM*
*PLUTONIUM*
*THORIUM*
*URANIUM*
**Separation Processes**
Basic science and technology, 9:1928 (RA;US)
**Transmutation**
Actinide transmutation with a $UF_6$ reactor, 9:2026 (J;US)

**ACTINIUM 227**
**Isotope Production**
Transuranium-element processing, 9:3037 (RA;US)

**ACTINIUM 233**
**Isotope Separation**
Identification of $^{233}Ac$, 9:3935 (J;US)

**ACTIVATED SLUDGE PROCESS**
Conversion of sewage sludge by anaerobic elimination of the heterofunction, 9:2656 (R;DE;In German)

**ACTIVATION DETECTORS**
**Performance Testing**
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)
**Specifications**
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)
**Spectra Unfolding**
Neutron spectra unfolding from measured detector activations, 9:3186 (R;DE;In German)

**ACTIVITY COEFFICIENT**
*See THERMODYNAMIC ACTIVITY*

**ADAMANTANE**
**NMR Spectra**
$^{13}C$ spin diffusion of adamantane, 9:2811 (J;US)
Multiple-quantum NMR in solids, 9:2867 (J;US)

**ADENOCARCINOMAS**
*See CARCINOMAS*

**ADGEZATOR**
*See ELECTRON-RING ACCELERATORS*

**ADJOINT FLUX**
**Data Covariances**
Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'", 9:2324 (J;US)
**Perturbation Theory**
Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'", 9:2324 (J;US)

**ADRIATIC SEA**
**Petroleum Deposits**
Development of a recovery method for Adriatic Sea heavy oil reservoirs, 9:1818 (BA;GB)

**ADSORPTION**
**Research Programs**
Research programs in adsorption carried out in the low temperature laboratory of UFRJ (Brazil), 9:3522 (RA;BR;In Portuguese)
**Thermodynamic Model**
Structure study and the adsorption system mechanism based on 'stratified volume' model, 9:3521 (RA;BR;In Spanish)

**ADVANCED GAS COOLED GRAPHITE MODERATED RE**
*See AGR TYPE REACTORS*

**ADVANCED THERMAL REACTOR FUGEN**
*See JATR REACTOR*

**ADVERSARIES**
**Nuclear Weapons**
Preliminary nuclear terrorist effects study (Detonation in city street), 9:3250 (RA;US)

**AEROMONAS**
**Population Density**
Effect of effluent from a nitrogen fertilizer factory and a pulp mill on the distribution and abundance of Aeromonas hydrophila in Albemarle Sound, North Carolina, 9:3381 (J;US)

**AFFIRMATIVE ACTION**
**Planning**
Affirmative Action Plan, October 1983 through September 1984, 9:2535 (R;US)

**AFTERLOADING**
**Irradiation Procedures**
Localization technique applied for the combined radiation treatment of uterine cancer, 9:3370 (RA;HU;In Hungarian, English)

**AGR REACTOR (WINDSCALE)**
*See WAGR REACTOR*

**AGR TYPE REACTORS**
*See also WAGR REACTOR*
**Coolants**
Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2242 (R;XA)

**AGRICULTURAL RESIDUES**
*See AGRICULTURAL WASTES*

**AGRICULTURAL WASTES**
**Anaerobic Digestion**
Amount of biogas and its availability for use in Finland, 9:2108 (R;FI;In Finnish)

**AGRICULTURE**
**Coordinated Research Programs**
Isotope and radiation applications to agricultural development in Asia and the Pacific Region. Speech given during the seminar, 9:3383 (R;MY)
**Fuel Consumption**
Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83, 9:1878 (R;US)

**AIR**
**Radioactivation**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**Sorptive Properties**
Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2902 (J;US)

**AIR CLEANING**
**Standards**
Canadian nuclear air cleaning standards and their application in Ontario Hydro, 9:2343 (RA;XA)

**AIR CLEANING SYSTEMS**
**Performance**
Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation, 9:2201 (RA;XA)
Design, operation and in-plant testing of off-gas cleaning systems at BWRs, 9:2202 (RA;XA)

**Regulatory Guides**
Need for revising US Nuclear Regulatory Commission Regulatory Guide 1.52 in light of NRC-sponsored research program results and other developments, 9:2200 (RA;XA)

**AIR CONDITIONERS**
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
**Heat Recovery Equipment**
In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program, 9:2619 (R;US)

**AIR CONDITIONING**
**Phase Change Materials**
Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3030 (J;US)

**AIR FILTERS**
**Design**
Demister apparatus for gaseous wastes carrying radioactive aerosols, 9:1952 (RA;XA;In French)
**Leak Testing**
Trends and developments for in-situ testing of HEPA filters, 9:3112 (RA;XA)
**Testing**
Analysis of the five years in-situ control of the cleaning filters used in the nuclear installations in France, 9:2344 (RA;XA;In French)
Comparison of testing methods for particulate filters, 9:3114 (RA;XA)
Comparison of some particulate air filter testing methods used in normal and unfavourable conditions, 9:3115 (RA;XA)
Experience with a standardized method and application of the recent trends for in-situ testing of HEPA-filtration systems, 9:3116 (RA;XA)
Testing HEPA filter response to high flow velocity and overpressure, 9:3113 (RA;XA)

**AIR HEATERS**
**Performance Testing**
MHD air heater technology development. Technical progress report, October 1, 1982-September 30, 1983, 9:2573 (R;US)

**AIR POLLUTION**
**Aerosols**
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3258 (R;US)
**Deposition**
Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models, 9:3259 (R;US)
**Flux Density**
Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models, 9:3259 (R;US)
**Health Hazards**
Respiratory effects of air pollutants, 9:3410 (R;SE;In Swedish)
Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review, 9:3408 (R;SE;In Swedish)

**AIR POLLUTION MONITORS**
**Calibration**
Harmonization of methods for measurements of $SO_2$. Final report, 9:3264 (R;US)
**Performance Testing**
Evaluation of developmental industrial hygiene instrumentation at the University of Minnesota-Duluth gasifier, 9:3263 (R;US)
**Remote Sensing**
Progress Report 1980-81-82, 9:3050 (R;SE)

**AIR PREHEATERS**
*See AIR HEATERS*

**AIR PURIFICATION**
*See AIR CLEANING*

**AIR SAMPLERS**
**Calibration**
Calibration of a decay-product collection and counting apparatus for the determination of exhaled thoron, 9:3198 (J;GB)
**Performance Testing**
Calibration of a decay-product collection and counting apparatus for the determination of exhaled thoron, 9:3198 (J;GB)

**AIRBORNE PARTICLES**
*See PARTICULATES*

**AIRBORNE PARTICULATES**
*See PARTICULATES*

**AIRCRAFT**
**Personnel Dosimetry**
High altitude radiation exposure in the SR-71: a preliminary report. Professional study, 9:3384 (R;US)

**ALAP**
*See RADIATION PROTECTION*

**ALASKA GAS PIPELINE**
**Charges**
Issues facing the future use of Alaskan NorthSlope natural gas, 9:1892 (R;US)

**ALBEDO-NEUTRON DOSEMETERS**
**Design**
Use of wrist albedo neutron dosimeters, 9:3195 (R;US)
**Performance Testing**
Use of wrist albedo neutron dosimeters, 9:3195 (R;US)

**ALCATOR DEVICE**
**Lower Hybrid Heating**
Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments, 9:4045 (R;US)
**Neutral Atom Beam Injection**
Fully ionized and total silicon abundances in the Alcator-C tokamak, 9:4136 (J;US)
**Parametric Instabilities**
Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments, 9:4045 (R;US)
**Silicon Ions**
Fully ionized and total silicon abundances in the Alcator-C tokamak, 9:4136 (J;US)

**ALCOHOL FUELS**
*Use for pure alcohols, alcohol-water mixtures, or alcohols with additives; for alcohol-gasoline mixtures, use GASOHOL.*
**Economic Impact**
Impacts of alcohol fuels on the US refining industry, 9:2641 (R;US)
**Research Programs**
Alcohol-Fuel-Technology Grant Program: an evaluation and summary, 9:2083 (R;US)

**ALCOHOLS**
*See also ETHANOL*
*METHANOL*
*PROPANOLS*
**Shear Properties**
Phases of insoluble monolayers: Comparison between the surface pressure-molecular area (Pi-A) diagram and shear modulus measurements, 9:2987 (J;US)

**ALFVEN WAVES**
**Cyclotron Resonance**
Conversion of compressional Alfven waves into ion cyclotron waves in inhomogeneous magnetic fields, 9:4059 (R;JP)

**ALGAE**
**Physiology**
Growth and physiology of an industrially useful macroalga (Chondrus crispus), analyzed by continuous measurement of gas exchange, 9:3378 (R;FR;In French)
**Plant Growth**
Growth and physiology of an industrially useful macroalga (Chondrus crispus), analyzed by continuous measurement of gas exchange, 9:3378 (R;FR;In French)

**ALKANES**
*See also CYCLOALKANES*
*2-2-DIMETHYLPROPANE*
*ETHANE*
*METHANE*
*PROPANE*

**Chemical Reactions**
Nickel ions affect a highly specific 1,4-dehydrogenation of hydrocarbons in the gas phase: metallacycles are not involved, 9:2965 (J;US)
**Dehydrogenation**
Nickel ions affect a highly specific 1,4-dehydrogenation of hydrocarbons in the gas phase: metallacycles are not involved, 9:2965 (J;US)

**ALKENES**
*See also BUTENES*
*CYCLOALKENES*
*ETHYLENE*
*PROPYLENE*
**Chemisorption**
Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100), 9:2961 (J;US)
**Synthesis**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)

**ALKINES**
*See ALKYNES*

**ALKYLATES**
*See ALCOHOLS*

**ALKYNES**
*See also ACETYLENE*
**Hydrogenation**
Coordinately unsaturated clusters. A novel catalytic reaction, 9:2982 (J;US)
**Vibrational States**
Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers, 9:2990 (J;US)

**ALLOY-A-286**
**Physical Radiation Effects**
Fracture-mechanics behavior of neutron-irradiated Alloy A-286, 9:2685 (R;US)

**ALLOY-HD-8077**
*See NICKEL BASE ALLOYS*

**ALLOY-HT-9**
**Creep**
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
**Physical Radiation Effects**
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
**Radioactivation**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)

**ALLOY-MA-754**
*See NICKEL BASE ALLOYS*

**ALLOY-MA-956**
*See IRON BASE ALLOYS*

**ALLOYS**
*See also ALUMINIUM ALLOYS*
*ANTIMONY ALLOYS*
*BERYLLIUM ALLOYS*
*BORON ALLOYS*
*COBALT ALLOYS*
*COPPER ALLOYS*
*GERMANIUM ALLOYS*
*GOLD ALLOYS*
*HEAT RESISTING ALLOYS*
*INDIUM ALLOYS*
*IRON ALLOYS*
*LITHIUM ALLOYS*
*MAGNESIUM ALLOYS*
*MOLYBDENUM ALLOYS*
*NICKEL ALLOYS*
*NIOBIUM ALLOYS*
*SCANDIUM ALLOYS*
*SILICON ALLOYS*
*SILVER ALLOYS*
*TANTALUM ALLOYS*
*TIN ALLOYS*
*TITANIUM ALLOYS*
*VANADIUM ALLOYS*
*YTTRIUM ALLOYS*
*ZINC ALLOYS*
*ZIRCONIUM ALLOYS*
**Carburization**
Materials selection for advanced-HTGR component development, 9:2250 (J;US)
**Corrosion**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Corrosion Fatigue**
Materials selection for advanced-HTGR component development, 9:2250 (J;US)
**Flow Stress**
A form of Hall-Petch law for the strength of glassy metals, 9:2764 (J;DD)
**Microstructure**
A form of Hall-Petch law for the strength of glassy metals, 9:2764 (J;DD)
**Physical Radiation Effects**
Use of the disk bend test to assess irradiation performance of structural alloys, 9:2682 (R;US)
**Welded Joints**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)

**ALLOY-WAZ-16**
*See NICKEL BASE ALLOYS*

**ALLYL RADICALS**
**Structural Chemical Analysis**
Theoretical study of the allyl radical: structure and vibrational analysis, 9:2984 (J;US)
**Vibrational States**
Theoretical study of the allyl radical: structure and vibrational analysis, 9:2984 (J;US)

**ALPHA PARTICLES**
*Emitted by nuclei.*
**Charged-Particle Transport**
Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment, 9:4141 (R;FR;In French)
**Energy Losses**
Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment, 9:4141 (R;FR;In French)

**ALPHA REACTIONS**
**Breakup Reactions**
Study of the particle unstable S-nucleus resonances $^{5}$Lisup(3/2-) and $^{5}$Hesup(3/2-) in the reaction α+d->α+p+n at the c.m. energy Esub(CMS)=9.3 MeV, 9:3860 (R;DE;In German)
**Compound-Nucleus Reactions**
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)
**Cross Sections**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Knock-Out Reactions**
Spectroscopy of the neutrons from the decay of the giant quadrupole resonance region in $^{208}$Pb, 9:3921 (R;DE;In German)
**Quasi-Elastic Scattering**
Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3862 (R;SU)
**Spallation**
Projectile fragmentation and light particle emission from 70 MeV/nucleon α particles on $^{197}$Au, 9:3919 (R;FR)

**ALPHA-BEARING WASTES**
**Certification**
The certification program of transuranic wastes at INEL, 9:2032 (J;US)
**Geochemistry**
Some chemical issues involved in the management and disposal of TRU wastes, 9:2029 (J;US)
**Radioactive Waste Processing**
Solidification of alpha-bearing wastes in ceramic, 9:1948 (R;XE;In German)

**ALTERNATE FUELS**
*See FUEL SUBSTITUTION*

**ALUMINIA**
*See ALUMINIUM OXIDES*

**ALUMINIUM**
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Crystal Structure**
Multilayer relaxation of interlayer registry and spacing at high-index metal surfaces, 9:2712 (J;US)

**Dispersions**
Local field effects in the absorbed monoshell reflectance on substrates with spatial dispersion, 9:2696 (RA;BR;In Spanish)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electric Conductivity**
Oxidation effects on the electric resistance of In and Al in thin layers, 9:2693 (RA;BR;In Spanish)
**Leaching**
Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations, 9:3285 (R;US)
**Photoelectron Spectroscopy**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**Photon Transport**
Calculation of stray dose distributions of gamma and X radiation in homogeneous and inhomogeneous media by means of Monte-Carlo methods, 9:3972 (B;DE;In German)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Quantity Ratio**
Analysis of the Al-Ag thin film system by Rutherford Backscattering Spectroscopy (RBS) and Auger Electron Spectroscopy (AES), 9:2695 (RA;BR;In Spanish)
**Radioactivation**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)

**ALUMINIUM 26**
**Nucleosynthesis**
Nucleosynthesis of $^{26}Al$ at low stellar temperatures, 9:3484 (J;US)

**ALUMINIUM 27 TARGET**
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)

**ALUMINIUM ALLOYS**
*See also ALUMINIUM BASE ALLOYS*
**Deformation**
Metal surface deformation and subsurface defect structure: a microscopy correlation study, 9:2761 (BA;US)
**Electron Diffraction**
Determination of symmetry changes in ordered alloys by convergent beam electron diffraction (Ni-Al-Ta; Ni-Al-Mo), 9:2748 (BA;US)
**Oxidation**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)
**Phase Studies**
Example of the use of combined techniques of analytical transmission electron microscopy for phase identification (Ti-8Al-4Y), 9:2749 (BA;US)
**Phase Transformations**
Diffusion decay of binary precipitation in "transitional" asymptotic range, 9:2703 (R;SU;In Russian)
**Physical Radiation Effects**
The role of environmental conditions in in-situ experiments in the high-voltage electron microscope, 9:3219 (J;DD)
**Surface Properties**
Metal surface deformation and subsurface defect structure: a microscopy correlation study, 9:2761 (BA;US)
**Thermal Expansion**
The thermal expansion of the directionally solidified Al-$CuAl_2$ eutectic, 9:2753 (J;NL)

**ALUMINIUM ARSENIDES**
**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Crystal Structure**
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
**Crystal-Phase Transformations**
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)

**ALUMINIUM BASE ALLOYS**
**Stress Corrosion**
Stress corrosion testing of 5083 aluminum, 9:2751 (J;US)

**ALUMINIUM BROMIDES**
**Raman Spectra**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)
**Thermodynamic Properties**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)

**ALUMINIUM CHLORIDES**
**Raman Spectra**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)
**Thermodynamic Properties**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)

**ALUMINIUM COMPOUNDS**
*See also ALUMINIUM ARSENIDES*
*ALUMINIUM BROMIDES*
*ALUMINIUM CHLORIDES*
*ALUMINIUM HYDRIDES*
*ALUMINIUM OXIDES*
*ALUMINIUM PHOSPHIDES*
**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)

**ALUMINIUM HYDRIDES**
**Catalytic Effects**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**ALUMINIUM OXIDES**
**Calcination**
Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls, 9:2918 (J;US)
**Catalytic Effects**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Chemical Preparation**
Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls, 9:2918 (J;US)
**Deactivation**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Dielectric Properties**
Low-temperature dielectric constant of near-stoichiometric Na $\beta$-alumina, 9:2803 (J;US)
**Evaporation**
Investigation of the evaporation thermodynamics and stationary states (so-called "congruent states") in the study of

oxides and their mixtures by the effusion method--application to $Al_2O_3$, CaO, and the mixtures $Al_2O_3$-CaO and $Ti_2O_3$-$TiO_2$, 9:2792 (J;US)

**Reduction**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)

**Thermal Diffusivity**
Thermal diffusivities of molybdenum/alumina cermets, 9:2794 (J;US)

**ALUMINIUM PHOSPHIDES**

**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)

**Crystal Structure**
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)

**Crystal-Phase Transformations**
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)

**Heterojunctions**
GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications, 9:3104 (J;US)

**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)

**ALUMINUM**
*See ALUMINIUM*

**ALVEOLI (PULMONARY)**
*See LUNGS*

**AMERICIUM**

**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)

**Recovery**
Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982, 9:1930 (R;US)

**AMERICIUM 241**

**Inhalation**
Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3399 (J;US)

**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**Single Intake**
Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3399 (J;US)

**AMERICIUM 242 TARGET**

**Neutron Reactions**
Measurement of the /SUP 242m/ Am neutron fission cross section, 9:3936 (J;US)

**AMERICIUM COMPOUNDS**
*See also AMERICIUM FLUORIDES*

**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)

**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)

**AMERICIUM FLUORIDES**

**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**AMINES**
*See also ANILINE*
*HYDROXYLAMINE*
*METHYLENE BLUE*
*POLYCYCLIC AROMATIC AMINES*
*TOLUIDINES*

**Absorption Spectra**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)

**Acoustic ESR**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)

**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**Electron Transfer**
Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3003 (J;US)

**Excitation**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)
Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3003 (J;US)

**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**Photochemical Reactions**
Formation of photoactive charge-transfer complexes between methylviologen and sacrificial electron donors. EDTA and triethanolamine, 9:3004 (J;US)

**AMINO ACIDS**
*Organic acids containing both a basic amino group and an acidic carboxyl group.*
*See also DTPA*
*EDTA*
*METHIONINE*

**Chemical Analysis**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)

**Chemical Bonds**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)

**Fluorescence**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)

**AMINO ALCOHOLS**
*See ALCOHOLS*
*AMINES*

**AMINO SUGARS**
*See AMINES*
*SACCHARIDES*

**AMINOBENZENE**
*See ANILINE*

**AMINOGLYCIDES**
*See AMINES*
*SACCHARIDES*

**AMINOTOLUENES**
*See TOLUIDINES*

**AMMONIA**

**Aerosols**
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3258 (R;US)

**Chemical Reactions**
Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2966 (J;US)

**Complexes**
Calculations on spin-paired species in metal-ammonia solutions, 9:2938 (J;US)

**Labelling**
On-line production of ($^{13}$N)-nitrogen from solid enriched ($^{13}$C)-targets, and its application to ($^{13}$N)-ammonia synthesis using microwave radiation, 9:3044 (J;GB)
**Phase Diagrams**
Phase diagram and transition properties of condensed ammonia to 10 kbar, 9:2085 (J;US)
**Raman Spectra**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)
**Thermodynamic Properties**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)

**AMMONIUM COMPLEXES**
**Agglomeration**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)
**Dynamics**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)
**Geometry**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)

**AMMONIUM COMPOUNDS**
**Raman Spectra**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)
**Thermodynamic Properties**
Raman spectra, ab initio molecular orbital calculations, vibrational analysis, and thermodynamic functions for $NH_3$:$AlX_3$ (X = F, Cl, Br), 9:3590 (J;US)

**ANALOG-TO-DIGITAL CONVERTERS**
**On-Line Measurement Systems**
Two-channel time-to-digital converter, 9:3204 (R;SU;In Russian)

**ANALYSIS (GAS)**
*See GAS ANALYSIS*

**ANALYSIS (QUANTITATIVE CHEMICAL)**
*See QUANTITATIVE CHEMICAL ANALYSIS*

**ANGIOGRAPHY**
*See BIOMEDICAL RADIOGRAPHY*

**ANHARMONIC OSCILLATORS**
**Coupling**
van der Waals vibrational modes of the pentacenexR complexes (R = Ne, Ar, Kr), 9:3550 (J;US)
**Ground States**
Some results of the summation of constant sign asymptotic series of perturbation theory, 9:4009 (RA;SU;In Russian)
**Perturbation Theory**
Some results of the summation of constant sign asymptotic series of perturbation theory, 9:4009 (RA;SU;In Russian)
**Quantum Mechanics**
van der Waals vibrational modes of the pentacenexR complexes (R = Ne, Ar, Kr), 9:3550 (J;US)

**ANILINE**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**ANIONS**
*See also HYDROGEN IONS 1 MINUS*
**Beam Production**
Theoretical considerations associated with the production of negative ions in sputter-type ion sources, 9:3572 (J;US)

**ANTELOPES**
**Diet**
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3279 (RA;US)
**Ecology**
Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory, 9:3309 (RA;US)

**ANTENNAS**
**Blast Effects**
Structural response of the SATCOM antenna to a blast loading, 9:3063 (RA;US)
**Computer Codes**
Numerical electromagnetics code - method of moments. User's guide supplement for NEC-3 for modeling buried wires, 9:3101 (R;US)

**ANTIBARYONS**
**Cosmology**
Generation of baryon excess in SU/sub L/$_2$ x SU/sub R/$_2$ x SU/sub c/$_4$, 9:3795 (R;XA)

**ANTIFERROMAGNETIC MATERIALS**
**Spin**
Correlation functions of electronic and nuclear spins in a Heisenberg antiferromagnet semi-infinite medium, 9:3516 (RA;BR;In Portuguese)

**ANTILAMBDA PARTICLES**
**Weak Particle Decay**
Measurement of CP violation in $\Lambda$ decay, 9:3683 (RA;US)
Polarizion experiments with hyperons, 9:3694 (RA;US)

**ANTIMONY**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Uptake**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)

**ANTIMONY ALLOYS**
**Uses**
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3209 (R;US)

**ANTIMUONS**
*See MUONS PLUS*

**ANTINEUTRINO-NUCLEON INTERACTIONS**
**Charged-Current Interactions**
nu-bar/sub $\mu$/-nucleon charged-current total cross section for 5—250 GeV, 9:3726 (J;US)
**Deep Inelastic Scattering**
Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3794 (R;XA)
**Particle Production**
Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions, 9:3732 (R;FR;In French)
**Polarized Targets**
Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3794 (R;XA)

**ANTIPROTON REACTIONS**
**Experiment Planning**
Activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei, 9:3874 (RA;US)
New horizons in nuclear physics, 9:3858 (RA;US)
New scientific information from LAMPF II, 9:3906 (RA;US)
**Fragmentation**
Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles, 9:3922 (RA;US)
**Multiple Scattering**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)

**ANTIPROTONIC ATOMS**
*See HADRONIC ATOMS*

**ANTIPROTONS**
**Origin**
Origin of low energy antiprotons in cosmic rays, 9:3443 (R;SU)
**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)

**ANTIPYRINE**
**Labelling**
Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow, 9:3043 (J;GB)
**ANTIREFLECTION COATINGS**
**Damage**
Influence of deposition parameters on laser-damage threshold of silica-tantala AR coatings, 9:2789 (J;US)
Scandium oxide coatings for high-power UV laser applications, 9:2741 (J;US)
**ANTRIM SHALES**
*See BLACK SHALES*
**AORTA**
**Biomedical Radiography**
Application of a dimeric contrast medium (Hexabrix) in angiography, 9:3363 (RA;HU;In Hungarian, English)
**Computerized Tomography**
Noninvasive imaging of the abdominal aortic aneurysm, 9:3364 (RA;HU;In Hungarian, English)
**Pathological Changes**
Noninvasive imaging of the abdominal aortic aneurysm, 9:3364 (RA;HU;In Hungarian, English)
**Scintiscanning**
Noninvasive imaging of the abdominal aortic aneurysm, 9:3364 (RA;HU;In Hungarian, English)
**APARTMENT BUILDINGS**
**Energy Consumption**
Tenant-paid energy costs in multifamily rental housing: effects on energy use, owner investment, and the market value of energy, 9:2603 (R;US)
**Metering**
Tenant-paid energy costs in multifamily rental housing: effects on energy use, owner investment, and the market value of energy, 9:2603 (R;US)
**APPARATUS**
*See EQUIPMENT*
**APPENDIX (VERMIFORM)**
*See LARGE INTESTINE*
**APPLICATORS (RADIOTHERAPY)**
*See RADIATION SOURCES*
**AQUATIC ECOSYSTEMS**
**Biological Models**
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3335 (J;US)
**Eutrophication**
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3335 (J;US)
**Mineral Cycling**
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3335 (J;US)
**Population Dynamics**
Effects of operating the Mt. Elbert Pumped-Storage Powerplant on Twin Lakes, Colorado: 1981 report of findings. Technical report, 9:2094 (R;US)
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)
**AQUIFERS**
**Heat Storage**
Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2511 (R;XE;FR)
**Sensible Heat Storage**
Aquifer thermal energy storage: a well doublet experiment at increased temperatures, 9:2516 (J;US)
**ARACHIDONIC ACID**
**Metabolism**
Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism, 9:3422 (J;US)
**ARCHAEOLOGICAL SPECIMENS**
Area group: an example of style and paste compositional covariation in Maya pottery, 9:4231 (R;US)
History and ritual events on a Petexbatun Classic Maya polychrome vessel, 9:4230 (R;US)
**Activation Analysis**
Neutron activation analyses: Teotihuacan trade ceramics, 9:2882 (R;US)
**Data Acquisition**
Compositional attribution of non-provenienced Maya polychrome vessels, 9:2883 (R;US)
**ARCTIC REGIONS**
**Oil Wells**
Undersea excavation test for the protection of submerged equipment in the arctic seas, 9:1837 (BA;GB)
**Research Programs**
Assessment of cold-climate environmental research priorities. Appendixes A, B, 9:2538 (R;US)
**Soil Chemistry**
Dynamics of soil-forming processes in the Arctic, 9:3281 (BA;CA)
**Soils**
Dynamics of soil-forming processes in the Arctic, 9:3281 (BA;CA)
**Underwater Facilities**
Undersea excavation test for the protection of submerged equipment in the arctic seas, 9:1837 (BA;GB)
**ARGENTINA**
**Nuclear Energy**
Materials. The Argentine nuclear policy, 9:2547 (B;DE;In German)
**ARGENTINE REACTOR RA-3**
*See RA-3 REACTOR*
**ARGON**
**Condensates**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**Desorption**
Angular distribution of desorpted atoms of solid surfaces, 9:2819 (RA;BR;In Spanish)
**Electron Mobility**
Quasifree electron mobility by the method of partial waves in liquid hydrocarbons and in fluid argon, 9:2832 (J;US)
**Ion Pairs**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**Neutron Reactions**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**Nucleation**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Photoionization**
Inner-valence shell photoionization of $Ar_3$, $Ar_2$, $Kr_2$, and $Kr_3$, 9:3548 (J;US)
**Proton Reactions**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**Reflection**
Local field effects in the absorbed monoshell reflectance on substrates with spatial dispersion, 9:2696 (RA;BR;In Spanish)
**ARGON IONS**
**Ion-Molecule Collisions**
First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles, 9:3555 (J;US)
**ARGON METHOD**
*See ISOTOPE DATING*
**ARIZONA**
**Salt Caverns**
Red Lake Salt Cavern gas storage project, Mohave County, Arizona, 9:1900 (J;US)
**Thermal Waters**
Stable isotopic investigation of the ground water quality and transport systems in the Safford Valley, Arizona. Report for Oct 80-Sep 81, 9:2154 (R;US)
**ARKANSAS POWER-LIGHT-1 REACTOR**
*See ARKANSAS-1 REACTOR*

**ARKANSAS POWER-LIGHT-2 REACTOR**
*See ARKANSAS-2 REACTOR*
**ARKANSAS-1 REACTOR**
**Meltdown**
Insights from the Arkansas Nuclear One (ANO) unit one IREP analysis, 9:2491 (BA;US)
**Risk Assessment**
Insights from the Arkansas Nuclear One (ANO) unit one IREP analysis, 9:2491 (BA;US)
**ARKANSAS-2 REACTOR**
**Fuel Assemblies**
Benefits of extended burnup cycles at Arkansas Nuclear One-2, 9:2229 (J;US)
**Fuel Cycle**
Benefits of extended burnup cycles at Arkansas Nuclear One-2, 9:2229 (J;US)
**AROMATIC COMPOUNDS**
*See AROMATICS*
**AROMATICS**
*See also ANILINE*
*AZAARENES*
*BENZENE*
*CONDENSED AROMATICS*
*PHENOLS*
*POLYCYCLIC AROMATIC HYDROCARBONS*
*TETRALIN*
*TOLUENE*
**Isomerization**
Photoisomerization of charge-transfer complexes of hexamethyl(Dewar benzene). Contrasting paths for rearrangement involving adiabatic reaction and ionic photodissocation, 9:3019 (J;US)
**Radiolysis**
A pulse radiolysis study of the excitation of nitrogen and aromatic hydrocarbons in rare gas-additive mixtures: Evidence for subexcitation electron interactions, 9:3032 (J;US)
**Reduction**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983 (Fluorenone), 9:1766 (R;US)
**ARSENIC**
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Health Hazards**
Effect of arsenic on the system, 9:3407 (R;SE;In Swedish)
**Removal**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**ARSENIC IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**ARSENIC SULFIDES**
**Phase Transformations**
Soft acoustic mode in thallium arsenic sulphide $Tl_3AsS_4$, 9:2873 (J;GB)
**ARTERIES**
*See also AORTA*
**Biomedical Radiography**
Angiography of hormone producing tumours of pancreas, 9:3358 (RA;HU;In Hungarian, English)
**ASPHALTENES**
**Chemical Preparation**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**ASPHALTS**
*See also ASPHALTENES*
**Heating**
Microwave methods and apparatus for paving and paving maintenance. Final report on Phase I, 9:2637 (R;US)
**ASPIRIN**
*See ACETYLSALICYLIC ACID*
**ASSOCIATED GAS**
**Materials Handling**
Offshore LNG transfer system, 9:1896 (BA;GB)
**ASTATINE 201**
**High Spin States**
High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3926 (J;US)
**ASTATINE 203**
**High Spin States**
High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3926 (J;US)
**ASTROPHYSICS**
**Meetings**
Review lectures IV. Report on the scientific conference in Strasbourg, February 24-26, 1982, 9:3491 (B;DE)
**Pair Production**
NASA/Goddard Space Flight Center contributions to the Workshop on Positron-Electron Pairs in Astrophysics, 9:3456 (R;US)
**ATLANTIC OCEAN**
*See also NORTH SEA*
**Continental Slope**
Effects of continental slope on the mean shelf circulation, 9:3440 (J;US)
**Oceanography**
Effects of continental slope on the mean shelf circulation, 9:3441 (J;US)
**Water Currents**
Effects of continental slope on the mean shelf circulation, 9:3440 (J;US)
**ATMOSPHERIC EXPLOSIONS**
**Simulation**
Los Alamos laser simulation of high-altitude nuclear-explosion effects. Final report, 9:3251 (R;US)
**ATMOSPHERIC EXPOSURE CHAMBERS**
*See EXPOSURE CHAMBERS*
**ATOMIC ABSORPTION SPECTROSCOPY**
*See ABSORPTION SPECTROSCOPY*
**ATOMIC BEAMS**
**Cluster Beams**
Supersonic copper clusters, 9:3582 (J;US)
**ATOMIC BOMBS**
*See NUCLEAR WEAPONS*
**ATOMIC ENERGY**
*See NUCLEAR ENERGY*
**ATOMIC ENERGY LAWS**
**Work**
Thirty-first to thirty-third annual report on the work of the Institut fuer Voelkerrecht at the Universitaet Goettingen. 1 April 1979 to 31 December 1981, 9:4270 (B;DE;In German)
**ATOMIC EXPLOSIONS**
*See NUCLEAR EXPLOSIONS*
**ATOMIC MODELS**
**Hartree-Fock Method**
Atomic structure Hartree-Fock-relativistic and Hartree-XR program-package translated for IBM from the Cowan-CDC version, plus the Zeeman parameter optimisation routines, 9:3537 (R;US)
**ATOMIC WEAPONS**
*See NUCLEAR WEAPONS*
**ATOM-MOLECULE COLLISIONS**
**Sudden Approximation**
Validity of the energy sudden approximation, 9:3587 (J;US)
**ATOMS**
*See also HADRONIC ATOMS*
*MUONIC ATOMS*
**Chemisorption**
Single atom and-molecules chemisorption on solid surfaces, 9:3979 (RA;BR;In Portuguese)

**ATUCHA REACTOR**
**Reactor Maintenance**
Maintenance in a nuclear power station as an indicator of technological transfer: Atucha-1 experience, 9:2273 (J;US)
**ATUCHA-1 REACTOR**
*See ATUCHA REACTOR*
**ATWS**
*Anticipated transients without scram.*
**Heat Transfer**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility (PWR), 9:2405 (R;US)
Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4, 9:2439 (R;US)
Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility (PWR), 9:2402 (R;US)
**Hydraulics**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility (PWR), 9:2405 (R;US)
Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4, 9:2439 (R;US)
Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility (PWR), 9:2402 (R;US)
**AUFWUCHS**
**Biological Adaptation**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)
**Taxonomy**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)
**AURORAE**
**Lightning**
Nuclear-induced lightning aurora experiment. Technical report, 9:3495 (R;US)
**AUSTRALIA**
*See also SOUTH AUSTRALIA*
*WESTERN AUSTRALIA*
**Environmental Policy**
Uranium Mining (Environment Control) Act 1979 No. 46 of 1979, 9:2044 (R;AU)
**Packaging Rules**
Radioactive Ores and Concentrates (Packaging and Transport) Act 1980. No. 26 of 1980, 9:1937 (R;AU)
**Radiation Protection Laws**
Radiation Protection and Control Act 1982. No. 49 of 1982, 9:4259 (R;AU)
Radiation Safety Act 1975 - No. 44 of 1975, 9:4260 (R;AU)
Radiation (Safety Control) Ordinance 1978, 9:4261 (R;AU)
**Uranium Mines**
Uranium Mining (Environment Control) Act 1979 No. 46 of 1979, 9:2044 (R;AU)
**AUTOMOBILE EFFICIENCY STANDARDS**
*See AUTOMOBILES*
**AUTOMOBILES**
**Pollution Control**
Derivation of I/M benefits for pre-1981 light duty vehicles for low altitude, non-California areas, 9:2669 (R;US)
**AUTORADIOGRAPHS**
*See IMAGES*
**AUTORADIOGRAPHY**
**Dielectric Track Detectors**
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)
**AXIONS**
**Reviews**
Search for massive neutrinos, axions and SUSY particles at CERN SPS energies, 9:3616 (RA;XC)
**AZAARENES**
*See also ACRIDINES*
*CARBAZOLES*
*INDOLES*
*QUINOLINES*
**Biological Accumulation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Biological Effects**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**DNA Adducts**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Labelling**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Liquid Column Chromatography**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Mass Spectra**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Metabolites**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Ultraviolet Spectra**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**AZULENE**
**Absorption Spectra**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)
**Electronic Structure**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)
**Fluorescence Spectroscopy**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)
**Magnetic Circular Dichroism**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)
**Molecular Structure**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)
**Photoacoustic Spectroscopy**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
**Photoelectron Spectroscopy**
Molecular Rydberg states. Low-energy Rydberg states of azulene, 9:3007 (J;US)

## B

**B CODES**
**System Failure Analysis**
BAESNUM, a conversational computer program for the Bayesian estimation of a parameter by a numerical method, 9:4240 (R;XE)
**B-1235 RESONANCES**
**Particle Decay**
Observation of baryons in B-meson decay, 9:3713 (J;US)
**BACKGROUND RADIATION**
Decay of long-lived particles in the early universe, 9:3485 (J;US)

**Microwave Radiation**
Low-frequency measurement of the spectrum of the cosmic background radiation, 9:3471 (J;US)
**BAG MODEL**
Dynamics of the soliton bag, 9:3735 (R;US)
New vacuum structure, background strength and confinement, 9:3748 (R;XA)
**BAGHOUSES**
**Performance**
Particulates: caught at the filter line, 9:2190 (J;US)
**Research Programs**
Particulates: caught at the filter line, 9:2190 (J;US)
**BALLOONING INSTABILITY**
Ballooning mode spectrum in general toroidal systems, 9:4113 (J;US)
**BANKS**
*See COMMERCIAL BUILDINGS*
**BARIUM**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**BARIUM 140**
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**BARIUM 147**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**BARIUM 148**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**BARIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**BARIUM OXIDES**
**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**BARYON NUMBER**
**Symmetry Breaking**
Neutron-antineutron oscillations from an experimental point of view, 9:3624 (RA;HU)
**BARYON NUMBER 2 RESONANCES**
*See DIBARYON RESONANCES*
**BARYON RESONANCES**
*See also DIBARYON RESONANCES*
*Y*RESONANCES*
**Decay**
Measurement of the lifetime of bottom hadrons, 9:3710 (J;US)
**Particle Production**
Baryon spectroscopy, 9:3667 (RA;US)
**Particle Properties**
Baryon spectroscopy, 9:3667 (RA;US)
Pion-nucleon physics at LAMPF II, 9:3668 (RA;US)
**BARYON-BARYON INTERACTIONS**
*See also NUCLEON-ANTINUCLEON INTERACTIONS*
*NUCLEON-HYPERON INTERACTIONS*
*NUCLEON-NUCLEON INTERACTIONS*
**Coupling Constants**
Constant of the baryon-meson strong interaction, 9:3764 (R;SU;In Russian)
**BARYONS**
*See also ANTIBARYONS*
*BARYON RESONANCES*
*HYPERONS*
*NUCLEONS*
**Asymmetry**
Generation of baryon excess in SU/sub L/$_2$ x SU/sub R/$_2$ x SU/sub c/$_4$, 9:3795 (R;XA)
**Bag Model**
Topological soliton bag model for baryons, 9:3783 (J;US)
**Bound State**
New horizons in nuclear physics, 9:3858 (RA;US)
Search for a possible strangeness S = -2 dibaryon, 9:3637 (RA;US)
Search for strange dibaryons at KEK and LAMPF II, 9:3638 (RA;US)
**Chiral Symmetry**
Baryons as chiral solitons, 9:3816 (J;US)
**Decay**
Catalysis of flavor nonconservation by monopoles, 9:3784 (J;US)
**Ground States**
Ground state baryons in the non-relativistic quark model, 9:3763 (R;FR)
**Particle Structure**
Topological soliton bag model for baryons, 9:3783 (J;US)
**BASEMENT ROCK**
**Annual Energy Storage**
Energy economy of underground spaces and heat storage in bedrock, 9:2626 (R;FI;In Finnish)
**BATTERIES (ELECTRIC)**
*See ELECTRIC BATTERIES*
**BEAM EMITTANCE**
**Calorimeters**
Experience with a double-compensating beam calorimeter, 9:3140 (J;US)
**BEAM EXTRACTION**
**Plasma Diagnostics**
Determination of metastable fraction in an ion beam extracted from ECR plasma, 9:4067 (R;JP)
**BEAM INJECTION HEATING**
**Hybridization**
Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4064 (R;JP)
**BEAM MONITORS**
**Synchrotron Radiation**
Beam profile monitor systems for the 180 MeV stage of MAMI, 9:3139 (TG;US)
**BEAM NEUTRALIZATION**
**Laser Radiation**
Photodetachment technology, 9:4193 (R;US)
**BEAM PERVEANCE**
*See BEAM EMITTANCE*
**BEAM TRANSPORT**
**Superconducting Magnets**
A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport, 9:3071 (J;US)
**BEAM-PLASMA SYSTEMS**
**Dispersion Relations**
Dispersion relation for a relativistic electron beam in a plasma, 9:4115 (J;US)
**Plasma Instability**
Space-time evolution of the beam-plasma instability, 9:4103 (J;US)
**Plasma Waves**
Dispersion relation for a relativistic electron beam in a plasma, 9:4115 (J;US)
**BEAUTY PARTICLES**
**Coupling Constants**
Hadronic couplings of open beauty states, 9:3749 (R;XA)
**Reviews**
Search for beauty particles at the CERN SPS, 9:3615 (RA;XC)
**Semileptonic Decay**
Inclusive production of electrons and muons in multihadronic events at PETRA, 9:3619 (R;DE)
**BEETLES**
**Contamination**
Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area, 9:3293 (RA;US)

**Population Density**
Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area, 9:3293 (RA;US)
**Radioecology**
Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area, 9:3293 (RA;US)

**BELGIUM**
**Bilateral Agreements**
Scientific cooperation agreement on an investigation and surveillance programme on the site for radioactive waste disposal in the North-East Atlantic between the Nuclear Research Centre (CEN), Belgium and the National Laboratory of Industrial Engineering and Technology (LNETI), Portugal, 9:1985 (R;PT;In Portuguese)

**BELLOWS**
**Supports**
Temporary support for a UHV sample manipulator during bakeout, 9:3099 (J;US)

**BELOYARSK-3 REACTOR**
**Fuel Element Clusters**
Method for calculating the temperature field in the fast reactor fuel assembly with random distribution of parameters by the Monte Carlo method, 9:2254 (R;SU;In Russian)

**BENTHOS**
**Radiation Monitoring**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**BENTONITE**
**Response Modifying Factors**
Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3387 (R;FR;In French)

**BENZANTHRACENE**
**Mutagen Screening**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Photochemical Reactions**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)

**BENZENE**
**Adsorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Chemisorption**
Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100), 9:2961 (J;US)
**Crystal Structure**
Efficient scheme for calculation of low-energy electron-diffraction intensities in the presence of large superlattices, with application to the structural analysis of benzene adsorbed on Rh(111), 9:2856 (J;US)
**Desorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Dimerization**
Theoretical study of possible benzene dimerizations under high-pressure conditions, 9:2974 (J;US)
**Electron Diffraction**
Efficient scheme for calculation of low-energy electron-diffraction intensities in the presence of large superlattices, with application to the structural analysis of benzene adsorbed on Rh(111), 9:2856 (J;US)
**Mass Spectra**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)

**BENZOIC ACID**
**PH Value**
Substituent bulk effects on solvation, 9:2983 (J;US)

**BENZOPYRENE**
**Biological Effects**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Mutagen Screening**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Photochemical Reactions**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)

**BENZOPYRROLES**
*See INDOLES*

**BENZYL RADICALS**
**Absorption Spectroscopy**
Use of spectral simulations for the assay of radical concentrations by ESR, 9:2994 (J;GB)
**Acoustic ESR**
Use of spectral simulations for the assay of radical concentrations by ESR, 9:2994 (J;GB)

**BER-2 REACTOR**
**Fuel Elements**
Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB, 9:2366 (RA;US)

**BERKELIUM 247**
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)

**BERKELIUM FLUORIDES**
**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**BERKELIUM OXIDES**
**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**BERL SADDLES**
*See COLUMN PACKING*

**BERLIN-2 RESEARCH REACTOR**
*See BER-2 REACTOR*

**BERNSTEIN MODE**
**Conversion**
Mode conversion and local heating below the second electron cyclotron harmonic, 9:4060 (R;JP)

**BERYLLIUM**
*See also BERYLLIUM-BETA*
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Proton Reactions**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)

**BERYLLIUM 9**
**Hypernuclei**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)

**BERYLLIUM 9 TARGET**
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Kaon Minus Reactions**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)

**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)

**BERYLLIUM ALLOYS**
**Ferromagnetism**
Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/, 9:2758 (J;GB)
**Production**
Beryllium-containing high specific strength amorphous alloys, 9:2765 (J;US)
**Superconductivity**
Superconducting ground state of a strongly interacting electron system: $UBe_{13}$, 9:2705 (R;US)
**Tensile Properties**
Beryllium-containing high specific strength amorphous alloys, 9:2765 (J;US)

**BERYLLIUM FLUORIDES**
**Infrared Spectra**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Neutron Diffraction**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Raman Spectra**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Structure Factors**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)

**BERYLLIUM IONS**
**Binding Energy**
Three holes bound to a double acceptor: $Be^+$ in germanium, 9:2845 (J;US)

**BERYLLIUM MODERATORS**
*See BERYLLIUM*

**BERYLLIUM-BETA**
**Physical Properties**
Stabilization of $\beta$-Be at room temperature by a rapid quench technique, 9:2760 (J;US)
**Stabilization**
Stabilization of $\beta$-Be at room temperature by a rapid quench technique, 9:2760 (J;US)

**BESSEL DIFFERENTIAL EQUATION**
*See FOKKER-PLANCK EQUATION*

**BETA BACKSCATTERING GAGES**
*See RADIOMETRIC GAGES*

**BETA BEAMS (ELECTRONS)**
*See ELECTRON BEAMS*

**BETA BEAMS (POSITRONS)**
*See POSITRON BEAMS*

**BETA DECAY**
*For neutron and nuclear decay.*
**Neutrinos**
No-neutrino double beta decay: more than one neutrino, 9:3706 (R;US)

**BETA DOSIMETRY**
**Chemical Dosemeters**
Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment, 9:3169 (RA;XA)
**Extrapolation Chambers**
Properties of an extrapolation chamber for beta radiation dosimetry. Determination of calibration factors, 9:3172 (R;BR;In Portuguese)
**Research Programs**
Beta-dosimetry studies at LLNL, 9:3975 (R;US)

**BETATRON OSCILLATIONS**
**Nonlinear Problems**
Effect of third order discretized resonances (2$\nu$sub(z)-$\nu$sub(x)=1) upon the movement of particles in cyclic accelerators, 9:3136 (RA;HU;In Russian)

**BICRYSTALS**
**Capacitance**
Impact ionization near GaAs grain boundaries, 9:2835 (J;US)
**Electroluminescence**
Impact ionization near GaAs grain boundaries, 9:2835 (J;US)

**BILE DUCTS**
*See BILIARY TRACT*

**BILIARY TRACT**
**Biomedical Radiography**
Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods, 9:3362 (RA;HU;In Hungarian, English)
**Dynamic Function Studies**
Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods, 9:3362 (RA;HU;In Hungarian, English)
**Scintiscanning**
Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods, 9:3362 (RA;HU;In Hungarian, English)
**Ultrasonography**
Quantitative measurement of gallbladder emptying by radionuclide, roentgenologic and ultrasonographic methods, 9:3362 (RA;HU;In Hungarian, English)

**BINARY ALLOY SYSTEMS**
**Segregation**
Surface effect theory in binary alloys: surfaces with cut-off, 9:3513 (RA;BR;In Spanish)

**BINARY MIXTURES**
**Microstructure**
Microstructure of two-phase random media. II. The Mayer--Montroll and Kirkwood--Salsburg hierarchies, 9:2954 (J;US)
**Phase Studies**
Microstructure of two-phase random media. II. The Mayer--Montroll and Kirkwood--Salsburg hierarchies, 9:2954 (J;US)
**Statistical Mechanics**
Microstructure of two-phase random media. II. The Mayer--Montroll and Kirkwood--Salsburg hierarchies, 9:2954 (J;US)
**Thermodynamic Properties**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**Transport Theory**
Enskog theory for multicomponent mixtures. II. Mutual diffusion, 9:3598 (J;US)

**BINARY STARS**
**X-Ray Spectra**
Evidence for an ~300 day period in Cygnus X-1, 9:3482 (J;US)

**BINDERS**
**Comparative Evaluations**
Guide to radiation fixatives, 9:3038 (R;US)
**Cost**
Guide to radiation fixatives, 9:3038 (R;US)

**BIOGAS**
*See METHANE*

**BIOGAS PROCESS**
Amount of biogas and its availability for use in Finland, 9:2108 (R;FI;In Finnish)

**BIOLOGICAL SHIELDS**
**Inspection**
Shield integrity examinations at the NWCF, 9:2048 (RA;CA)
**Standards**
American National Standard: program for testing radiation shields in light-water reactors (LWR), 9:2506 (B;US)

**BIOMASS**
**Hydrogenation**
High pressure hydrogenation of solid fuels, 9:1775 (R;FI;In Finnish)
**Research Programs**
Overview for DOE's Biomass Thermochemical Conversion Program, 9:2080 (R;US)

**BIOMASS CONVERSION PLANTS**
*Use only for plants converting biomass to fuel, do NOT use for plants preparing wastes and biomass for combustion.*
**Test Facilities**
Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82, 9:2074 (R;US)

**BIOMASS PLANTATIONS**
**Management**
Tree species and management strategies for biomass production in the Lake States. Fuels from woody biomass. Annual

report, March 1, 1980-February 28, 1981 (Hybrid poplars, European black alders, white pine, balsom), 9:2101 (R;US)

**BIOMEDICAL RADIOGRAPHY**
*See also INDUSTRIAL RADIOGRAPHY.*
**Contrast Media**
Application of a dimeric contrast medium (Hexabrix) in angiography, 9:3363 (RA;HU;In Hungarian, English)
Double contrast method - why is it to be used only at every colon examination, and not at the stomach, 9:3361 (RA;HU;In Hungarian, English)
**Radiation Quality**
Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3374 (R;DE;In German)

**BIPYRIDINES**
**Absorption Spectra**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
**Agglomeration**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
**Electron Transfer**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
**Photochemical Reactions**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
Formation of photoactive charge-transfer complexes between methylviologen and sacrificial electron donors. EDTA and triethanolamine, 9:3004 (J;US)
Photochemistry of methyl viologen in aqueous and methanolic solutions, 9:3009 (J;US)

**BIRDS**
**Behavior**
Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory, 9:3342 (RA;US)
Evaluating the effects of a prescribed burn on the foraging ecology of sage and Brewer's sparrows, 9:3306 (RA;US)
**Ecology**
Ecological study of the American rough-legged hawk on the Idaho National Engineering Laboratory, 9:3317 (RA;US)
Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory, 9:3309 (RA;US)
Sage grouse on the Idaho National Environmental Research Park, 9:3319 (RA;US)
**Habitat**
Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory, 9:3342 (RA;US)
**Inventories**
Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory, 9:3342 (RA;US)
**Mortality**
Raptor electrocutions on the Idaho National Engineering Laboratory (Aquila chrysaetos, Buteo lagopus, Buteo jamaicensis, Bubo virginianus, Falco sparverius, Falco mexicanus, Buteo regalis), 9:3426 (RA;US)
**Population Density**
Effects of prescribed burning on nongame birds breeding in sagebrush communities - pre-burn phase, 9:3307 (RA;US)
Sage grouse census methods and populations in southeastern Idaho, 9:3341 (RA;US)
**Predator-Prey Interactions**
Raptor studies on the Idaho National Engineering Laboratory (Asio otus, Aquila chrysaetos, Haliaeetus leucocephalus), 9:3318 (RA;US)
**Radiation Doses**
Iodine-129 in muscle of waterfowl using the test reactor area radioactive leaching ponds in southeastern Idaho, 9:3328 (RA;US)
**Radioactivity**
Sage grouse on the Idaho National Environmental Research Park, 9:3319 (RA;US)
**Reproduction**
Effects of prescribed burning on nongame birds breeding in sagebrush communities - pre-burn phase, 9:3307 (RA;US)

**BISMUTH**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electrorefining**
Electrolyzer for obtaining and refining metals, 9:2711 (TG;US)
Test of electrolytic method for separating bismuth and lead in saline melts, 9:2768 (TJ;US)

**BISMUTH 209 TARGET**
**Iron 56 Reactions**
Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon, 9:3891 (J;US)
**Pion Minus Reactions**
Precompound analyses of spectra and yields following nuclear capture of stopped $\pi^-$, 9:3878 (J;US)

**BISMUTH 214**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**BITUMINOUS COAL**
**Dissolution**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1766 (R;US)
**Macerals**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1766 (R;US)

**BLACK HOLES**
**Accretion Disks**
Thick accretion disks around black holes, 9:3489 (BA;DE)

**BLACK SHALES**
**Explosive Fracturing**
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1891 (R;US)
Simulation and evaluation of explosive/propellant stimulation treatments, 9:1885 (RA;US)
**Fractured Reservoirs**
Concepts and applications in modeling the Devonian shale (SUGAR and SUGAR-MD models), 9:1869 (RA;US)
Performance of wells in naturally fractured reservoirs, 9:1872 (RA;US)
Simulation of Devonian shale infill drilling, 9:1888 (RA;US)
**Hydraulic Fracturing**
Status of technology associated with hydraulic fracture modeling, 9:1886 (RA;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)

**BLANKETS (BREEDING)**
*See BREEDING BLANKETS*

**BLAST EFFECTS**
**Fires**
Blast/fire interaction scaling, 9:3240 (RA;US)
**Simulation**
Air gun test facility, 9:3235 (RA;US)
Design of blast simulators for nuclear testing, 9:3249 (RA;US)

**BLASTING**
*See EXPLOSIVE FRACTURING*

**BLOCKING**
*See CHANNELING*

**BLOOD**
**Chemical Analysis**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)

**BLOWERS**
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
**BLOWOUT PREVENTERS**
**Control Systems**
Remote-control of a blowout preventer and instrumented pup-joint of a riser, 9:1826 (BA;GB)
**Design**
Remote-control of a blowout preventer and instrumented pup-joint of a riser, 9:1826 (BA;GB)
**BN-600 REACTOR**
*See BELOYARSK-3 REACTOR*
**BNL**
**Isotope Production**
Comparison between solid graphite and graphite cloth as a target backing material for an ISOL system, 9:3155 (J;NL)
**BOILER FUEL**
*See BOILER FUELS*
**BOILER FUELS**
**Fuel Substitution**
RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2086 (R;US)
**BOILING WATER COOLED AND MODERATED REACTO**
*See BWR TYPE REACTORS*
**BOLTZMANN COLLISION INTEGRAL**
*See BOLTZMANN EQUATION*
**BOLTZMANN EQUATION**
**Analytical Solution**
Completely solvable model of the nonlinear Boltzmann equation, 9:4034 (J;NL)
Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982, 9:3970 (J;US)
**BOLTZMANN TRANSPORT EQUATION**
*See BOLTZMANN EQUATION*
**BOLTZMANN-VLASOV EQUATION**
**Analytical Solution**
Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982, 9:3970 (J;US)
**Heisenberg Picture**
Liouville supersymmetrical equation for a quantum case, 9:4003 (R;SU;In Russian)
**Perturbation Theory**
Liouville supersymmetrical equation for a quantum case, 9:4003 (R;SU;In Russian)
**BONE MARROW**
**Supralethal Irradiation**
Principles and performances of supralethal whole-body irradiation in case of bone-marrow transplantation of patients with acute leukemia, 9:3372 (RA;HU;In Hungarian, German)
**Transplants**
Principles and performances of supralethal whole-body irradiation in case of bone-marrow transplantation of patients with acute leukemia, 9:3372 (RA;HU;In Hungarian, German)
**BONE TISSUES**
**Healing**
Tomographic and scintigraphic examinations of the autologic spongiosa transplantat of the infective pseudoarthrosis, 9:3356 (RA;HU;In Hungarian, English)
**BONES**
*See SKELETON*
**BOP**
*See BLOWOUT PREVENTERS*
**BOR-60 REACTOR**
**Failed Element Detection**
Complex of hardware and software means for fission product detection in the fast reactor sodium coolant and cover gas, 9:2387 (R;SU;In Russian)
**BORN-GREEN-YVON EQUATION**
*See BOLTZMANN EQUATION*
**BORON**
**Chemical Reaction Kinetics**
Chemiluminescence and laser induced fluorescence of boron atom reactions. Final progress report, 9:2906 (R;US)
**Chemiluminescence**
Chemiluminescence and laser induced fluorescence of boron atom reactions. Final progress report, 9:2906 (R;US)
**Removal**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**BORON ALLOYS**
**Magnetic Moments**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)
**Magnetization**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)
**Physical Radiation Effects**
Low temperature irradiation effects on iron-boron based amorphous metallic alloys (Electron irradiation), 9:2673 (R;FR;In French)
**BORON CARBIDES**
**Chemical Vapor Deposition**
Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2806 (BA;US)
**Physical Radiation Effects**
Boron carbide in pile behaviour Rapsodie experience (Neutron irradiation), 9:2772 (R;FR)
Physical properties of boron carbide (Neutron irradiation), 9:2771 (R;FR)
**BOROSILICATE GLASS**
**Dissolution**
Effect of repository heating on dissolution of glass waste, 9:2019 (J;US)
**Leaching**
Leach testing of INEL waste forms in a gamma field, 9:2022 (J;US)
**BOROSILICATES**
*See BOROSILICATE GLASS*
**BOSONS**
*See also GOLDSTONE BOSONS*
*MESONS*
**Distribution Functions**
Radial distribution function and second virial coefficient for interacting bosons, 9:4054 (R;XA)
**BOUNDARY-VALUE PROBLEMS**
**Numerical Solution**
Numerical solution of initial/boundary-value problems in one space dimension, 9:4249 (J;US)
**BRACKISH WATER ECOSYSTEMS**
*See AQUATIC ECOSYSTEMS*
**BRAKING RADIATION**
*See BREMSSTRAHLUNG*
**BRAUNSCHWEIG EXPERIMENTAL REACTOR**
*See FMRB REACTOR*
**BRAUNSCHWEIG RESEARCH REACTOR**
*See FMRB REACTOR*
**BRAWLEY GEOTHERMAL FIELD**
**Resource Development**
Imperial County geothermal development annual meeting: summary, 9:2150 (R;US)
**BRAZIL**
**Nuclear Power Plants**
Simulator training for nuclear power plant operation in Brazil, 9:2478 (J;US)
**BREAKWATERS**
*See DAMS*
**BREASTS**
*See MAMMARY GLANDS*
**BREEDER REACTORS**
*See also FBR TYPE REACTORS*
*LWBR TYPE REACTORS*
**Education**
A responsive and effective breeder reactor engineering curriculum, 9:2285 (J;US)
**Nuclear Engineering**
A responsive and effective breeder reactor engineering curriculum, 9:2285 (J;US)
**BREEDING BLANKETS**
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1924 (R;DE;In German)

**Design**
Granular flow considerations in the design of a cascade solid breeder reaction chamber, 9:4188 (R;US)
**Heat Transfer**
Calculation of temperature fields in the pulsed fusion reactor blanket elements, 9:4156 (R;SU;In Russian)
**Materials Testing**
First wall and blanket engineering development for magnetic fusion reactors, 9:4213 (BA;XA)
**Research Programs**
Final report on PE-II activities from August 1981-September 1983, 9:4152 (R;US)
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Simulators**
Final report on PE-II activities from August 1981-September 1983, 9:4152 (R;US)

**BREMSSTRAHLUNG**
*See also SYNCHROTRON RADIATION*
**Data Compilation**
Shape functions for atomic-field bremsstrahlung from electrons of kinetic energy 1—500 keV on selected neutral atoms 1< or =Z< or =92, 9:3566 (J;US)
**Targets**
Bremsstrahlung converter debris shields: test and analysis, 9:3151 (R;US)

**BREMSSTRAHLUNG (MAGNETIC)**
*See SYNCHROTRON RADIATION*

**BRIDGES (ELECTRIC)**
*See ELECTRIC BRIDGES*

**BRILLOUIN EFFECT**
**Momentum Transfer**
Momentum transfer in a Brillouin surface scattering, 9:3524 (RA;BR;In Portuguese)

**BRILLOUIN SCATTERING**
*See BRILLOUIN EFFECT*

**BRINES**
**Toxicity**
The Hawaii geothermal project: phytotoxicity of geothermal separator brine, an exploratory study, 9:3417 (J;NL)

**BROADLANDS GEOTHERMAL FIELD**
**Hydrology**
Radioactive tracers in geothermal underground water flow studies, 9:2152 (R;NZ)

**BROKEN-PAIR APPROXIMATION**
**Quasiparticle-Phonon Model**
Remarkable properties of the broken pair model 2 relation with the quasi-particle scheme, 9:3944 (R;FR)

**BROMINE 82**
**Isotopic Exchange**
Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow, 9:3043 (J;GB)
**Radiochemistry**
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow, 9:3043 (J;GB)

**BROMINE IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)

**BRONCHI**
**Partial Body Irradiation**
Upper and lower half-body irradiation of patients with inoperable particellular bronchial carcinoma, 9:3371 (RA;HU;In Hungarian, German)

**BRONCHOGENIC CARCINOMA**
*See CARCINOMAS*
*RESPIRATORY SYSTEM DISEASES*

**BROOKHAVEN AGS**
**Data Acquisition Systems**
MWPC data acquisition in the Brookhaven FASTBUS, 9:3162 (R;US)

**BROOKHAVEN NATIONAL LABORATORY**
*See BNL*

**BROWNS FERRY-1 REACTOR**
**Fault Tree Analysis**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)
**Risk Assessment**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)

**BROWNS FERRY-2 REACTOR**
**Fault Tree Analysis**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)
**Risk Assessment**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)

**BROWNS FERRY-3 REACTOR**
**Fault Tree Analysis**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)
**Risk Assessment**
Interim reliability evaluation program: Browns Ferry fault trees, 9:2494 (BA;US)

**BRUCE-1 REACTOR**
**Construction**
Bruce nuclear project, 9:2310 (R;CA)

**BUILDING MATERIALS**
*See also CONCRETES*
**Flammability**
Flammability testing state-of-the-art, 9:3087 (RA;US)

**BUILDINGS**
*See also COMMERCIAL BUILDINGS*
*EARTH-COVERED BUILDINGS*
*GREENHOUSES*
*OFFICE BUILDINGS*
*PUBLIC BUILDINGS*
*RESIDENTIAL BUILDINGS*
*SCHOOL BUILDINGS*
**Airtightness**
Air infiltration control in housing. A guide to International Practice, 9:2592 (R;SE)
**Blast Effects**
Structural debris experiments at operation MILL RACE, 9:3064 (RA;US)
**Energy Analysis**
Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes, 9:2609 (R;US)
**Energy Conservation**
Efficient energy use in area development planning - reducing heating energy need by measures of passive use of insolation, 9:2601 (RA;DE;In German)
Energy research in Berlin. Solar energy utilization by climate-adjusted planning and building, 9:2593 (R;DE;In German)
**Heating**
Intermittent heating of buildings, 9:2627 (R;FI;In Finnish)
**Ignition**
Heat conduction analog model of urban fire spread, 9:3236 (RA;US)
**Mass Transfer**
Transient analysis of the thermal and moisture physical behaviour of building constructions, 9:2628 (R;FI)
**Passive Solar Heating Systems**
Efficient energy use in area development planning - reducing heating energy need by measures of passive use of insolation, 9:2601 (RA;DE;In German)
**Thermal Conduction**
Transient analysis of the thermal and moisture physical behaviour of building constructions, 9:2628 (R;FI)
**Thermal Conductivity**
Thermal insulation ordinance and utilization of solar energy, 9:2595 (RA;DE;In German)
**Thermal Insulation**
Thermal insulation ordinance and utilization of solar energy, 9:2595 (RA;DE;In German)
**Ventilation**
Intermittent heating of buildings, 9:2627 (R;FI;In Finnish)

**BUILDINGS (CONTAINMENT)**
*See CONTAINMENT BUILDINGS*
**BUNDLES (FUEL ELEMENTS)**
*See FUEL ELEMENT CLUSTERS*
**BURNER FUEL OIL**
*See HEATING OILS*
**BURNERS**
*See also OIL BURNERS*
**Fuel Substitution**
Direct combustion of industrial dry, composite waste in suspension. Final report, 9:2642 (R;US)
**BURSA OF FABRICIUS**
*See BIRDS*
**BURST CAN DETECTION**
*See FAILED ELEMENT DETECTION*
**BURST SLUG DETECTION**
*See FAILED ELEMENT DETECTION*
**BUTANOIC ACID**
*See BUTYRIC ACID*
**BUTENES**
**Adsorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Desorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Mass Spectra**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**BUTYLENES**
*See BUTENES*
**BUTYRIC ACID**
**Biosynthesis**
Methanol bioconversion by Butyribacterium methylotrophicum--batch fermentation yield and kinetics, 9:2127 (J;US)
**BWR TYPE REACTORS**
*See also BROWNS FERRY-1 REACTOR*
*BROWNS FERRY-2 REACTOR*
*BROWNS FERRY-3 REACTOR*
**Air Cleaning Systems**
Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation, 9:2201 (RA;XA)
Design, operation and in-plant testing of off-gas cleaning systems at BWRs, 9:2202 (RA;XA)
Need for revising US Nuclear Regulatory Commission Regulatory Guide 1.52 in light of NRC-sponsored research program results and other developments, 9:2200 (RA;XA)
**Biological Shields**
American National Standard: program for testing radiation shields in light-water reactors (LWR), 9:2506 (B;US)
**Containment Systems**
American National Standard: containment-system leakage-testing requirements, 9:2211 (B;US)
**Control Elements**
Results of the poolside nondestructive examination of irradiated control blades removed from BWRs, 9:2341 (J;US)
**Coolant Cleanup Systems**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)
**Core Catchers**
System study on the development of a core catcher concept for light water reactors. Final report/main volume, 9:2429 (R;DE;In German)
Systems study for development of a core catcher for LWR-type reactors. Final report/materials, 9:2411 (R;DE;In German)
**Critical Heat Flux**
Experimental evidence suppporting two-mechanism critical heat flux, 9:2210 (J;GB)
**Electrical Equipment**
Relationship of fire protection research to plant safety, 9:2452 (R;US)
**Failure Mode Analysis**
Interim results of the accident sequence evaluation program (ASEP), 9:2451 (R;US)
**Fission Product Release**
Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation, 9:2201 (RA;XA)
**Fuel Assemblies**
Conceptual design of a fuel assembly for extended operational cycle length in LWRs, 9:2208 (J;US)
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2195 (R;US)
Fuel designs for light water reactors, 9:2228 (J;US)
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)
**Fuel Channels**
BWR fuel channels performance up to 2000 EFPD, 9:2209 (J;US)
**Gaseous Wastes**
Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system, 9:2203 (RA;XA;In French)
**Ice Condensers**
Ice-condenser containment loadings during severe accidents, 9:2445 (R;US)
**Loss of Coolant**
NRC plant-analyzer development at BNL, 9:2397 (R;US)
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)
**Meltdown**
Core melt/coolant interactions: modelling, 9:2447 (R;US)
Core melt/coolant interactions: experiments, 9:2446 (R;US)
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
**Off-Gas Systems**
Design, operation and in-plant testing of off-gas cleaning systems at BWRs, 9:2202 (RA;XA)
**Pipelines**
Reliability analysis for stiff versus flexible piping, 9:2206 (R;US)
**Plutonium Recycle**
Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report, 9:2196 (R;XE;In French)
Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings, 9:2197 (R;XE)
**Power-Cooling-Mismatch Accidents**
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)
**Pressure Vessels**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
**Primary Coolant Circuits**
Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2198 (R;SU;In Russian)
**Radioactive Waste Processing**
American National Standard: liquid radioactive-waste-processing system for light-water-reactor plants, 9:2345 (B;US)
**Reactor Accidents**
Ice-condenser containment loadings during severe accidents, 9:2445 (R;US)
Interim results of the accident sequence evaluation program (ASEP), 9:2451 (R;US)
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
SARRP: risk rebaselining and risk reduction analysis, 9:2448 (R;US)
**Reactor Cooling Systems**
American National Standard: overpressure protection of low-pressure systems connected to the reactor-coolant pressure boundary, 9:2214 (B;US)
**Reactor Core Disruption**
Comparisons of the SCDAP computer code with bundle data under severe accident conditions, 9:2404 (R;US)

**Reactor Maintenance**
Experience in transfer of BWR maintenance technology, 9:2472 (J;US)
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
**Reactor Materials**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
**Reactor Operation**
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2438 (R;US)
**Reactor Safety**
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program, 9:2406 (R;US)
PWR and BWR safety systems layout, 9:2413 (R;DE)
Relationship of fire protection research to plant safety, 9:2452 (R;US)
Safety systems of heavy water reactors and small power reactors, 9:2205 (R;DE)
**Reliability**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)
**Risk Assessment**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)
**Secondary Coolant Circuits**
Secondary systems of PWR and BWR, 9:2204 (R;DE)
**Transient Overpower Accidents**
BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2456 (J;US)
**Transients**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)

## C

**CABLES (ELECTRIC)**
*See ELECTRIC CABLES*
**CACTACEAE**
*See CACTI*
**CACTI**
**Sensitivity**
Low temperature tolerance and cold hardening of cacti, 9:3382 (J;US)
**CADMIUM**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
**Biological Effects**
Effect of cadmium on transmitter transportation, 9:3405 (R;SE;In Swedish)
**Chemical Reactions**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Uptake**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**CADMIUM SULFIDE SOLAR CELLS**
**Fabrication**
Integrated thin film solar cell generators with higher output voltages, 9:2103 (R;XE)
**Performance Testing**
Integrated thin film solar cell generators with higher output voltages, 9:2103 (R;XE)
**CADMIUM SULFIDES**
**Heterojunctions**
Studies in the CdS/$Cu_2S$ heterojunction, 9:2821 (RA;BR;In Portuguese)
**Photovoltaic Conversion**
Studies in the CdS/$Cu_2S$ heterojunction, 9:2821 (RA;BR;In Portuguese)
**CADMIUM TELLURIDES**
**Refractivity**
Linear and nonlinear intensity dependent refractive index of Hg/sub 1-x/Cd/sub x/Te, 9:2842 (J;US)
**Sample Preparation**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**Surface Treatments**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**CALCINED WASTES**
**Leaching**
Miscellaneous programs, 9:1929 (RA;US)
**Radiation Effects**
Radiation damage in nuclear waste ceramics, 9:2788 (J;US)
**CALCIUM**
**Diffusion**
Diffusion assisted by radiation as a surface protection method, 9:2694 (RA;BR;In Portuguese)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**CALCIUM 40 REACTIONS**
**Fusion Reactions**
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)
**CALCIUM 40 TARGET**
**Calcium 40 Reactions**
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)
**Kaon Plus Reactions**
Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3886 (RA;US)
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Proton Reactions**
Energy dependence of the relativistic impulse approximation for proton-nucleus elastic scattering, 9:3889 (J;US)
**CALCIUM 48**
**Beta Decay**
No-neutrino double beta decay: more than one neutrino, 9:3706 (R;US)
**CALCIUM 48 TARGET**
**Kaon Plus Reactions**
Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3886 (RA;US)
**CALCIUM CARBONATES**
**Dissolution**
Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83, 9:1797 (R;US)
**CALCIUM OXIDES**
**Catalytic Effects**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)

**Evaporation**
Investigation of the evaporation thermodynamics and stationary states (so-called "congruent states") in the study of oxides and their mixtures by the effusion method--application to $Al_2O_3$, CaO, and the mixtures $Al_2O_3$-CaO and $Ti_2O_3$-$TiO_2$, 9:2792 (J;US)

**CALCIUM SILICATES**
**Enthalpy**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)
**Specific Heat**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)

**CALIFORNIA**
*See also BRAWLEY GEOTHERMAL FIELD*
**Meteorology**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)

**CALIFORNIUM 248**
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)

**CALIFORNIUM 252**
**Isotope Production**
Transuranium-element processing, 9:3037 (RA;US)

**CALORIMETERS**
**Design**
Calorimeter for measuring ac magnetic losses in small samples, 9:3217 (J;US)
Experience with a double-compensating beam calorimeter, 9:3140 (J;US)

**CALORIMETERS (PARTICLE)**
*See SHOWER COUNTERS*

**CAM**
*See COMPUTER-AIDED MANUFACTURING*

**CAMERA TUBES**
Streak cameras for soft x-ray and optical radiation, 9:4078 (R;US)

**CANADA**
**Energy Policy**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**Mosses**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Nuclear Industry**
Nuclear industry review. Problems and prospects 1981-2000, 9:2545 (R;CA)
**Radioactive Waste Disposal**
Strategy for the disposal of low- and intermediate-level radwastes in Canada, 9:1972 (RA;CA)
**Underground Disposal**
Strategy for the disposal of low- and intermediate-level radwastes in Canada, 9:1972 (RA;CA)
**Uranium Reserves**
Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles, 9:1905 (RA;CA)

**CANADA NRX RESEARCH REACTOR**
*See NRX REACTOR*

**CANADIAN NRU REACTOR**
*See NRU REACTOR*

**CANCER**
*See NEOPLASMS*

**CANDU REACTOR**
*See DOUGLAS POINT ONTARIO REACTOR*

**CANDU TYPE REACTORS**
*See also BRUCE-1 REACTOR*
*DARLINGTON-1 REACTOR*
*DOUGLAS POINT ONTARIO REACTOR*
*GENTILLY-2 REACTOR*
*PICKERING-1 REACTOR*

**Air Cleaning**
Canadian nuclear air cleaning standards and their application in Ontario Hydro, 9:2343 (RA;XA)
**Containment Systems**
PRESCON-2 simulation of the OECD/CSNI containment analysis standard problem no. 2, 9:2421 (RA;CA)
**Core Flooding Systems**
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)
**Engineered Safety Systems**
Fire protection program in CANDU stations, 9:2426 (RA;CA)
**Exports**
'Exporting' the Canadian licensing program, 9:2301 (RA;CA)
**Fault Tree Analysis**
Fault tree as a tool in safety analysis of nuclear power plants, 9:2420 (RA;CA)
**Fuel Channels**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2419 (RA;CA)
**Fuel Cycle**
Neutron cost criteria for long-term fissile fuel enhancement, 9:2267 (RA;CA)
Operational and economic aspects of CANDU fuel cycles, 9:2270 (J;US)
**Fuel Management**
Burnup improvement through reshuffling of fuel bundles of the first fuel change in CANDU-600, 9:2263 (RA;CA)
**Loss of Coolant**
CANDU safety research. A status report, 9:2417 (RA;CA)
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)
Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2419 (RA;CA)
**Moderators**
Improvement of the CANDU power cycle by moderator heat recovery, 9:2262 (RA;CA)
**Off-Gas Systems**
Canadian development program for off-gas management in nuclear facilities, 9:2255 (RA;XA)
**Personnel**
Process of designing effective training courses and programs, 9:2268 (RA;CA)
**Reactor Cores**
Experimental and analytical seismic study on 600 MWe CANDU core, 9:2427 (RA;CA)
High order method in flux mapping, 9:2261 (RA;CA)
**Reactor Fueling**
Simulation of fuelling operations for CANDU-type reactors, 9:2260 (RA;CA)
**Reactor Kinetics**
Neutron cost criteria for long-term fissile fuel enhancement, 9:2267 (RA;CA)
**Reactor Licensing**
'Exporting' the Canadian licensing program, 9:2301 (RA;CA)
**Reactor Materials**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
**Reactor Safety**
CANDU safety research. A status report, 9:2417 (RA;CA)
Reactor safety. Some current realities, 9:2423 (RA;CA)
**Reliability**
Reactor safety. Some current realities, 9:2423 (RA;CA)
**Risk Assessment**
Reactor safety. Some current realities, 9:2423 (RA;CA)
**Self-Powered Neutron Detectors**
Review of the dynamic response of self-powered flux detectors in CANDU reactors, 9:3173 (RA;CA)
**Steam Generators**
600 MW steam generator repair program. Hydraulically expanded tube to tubesheet joints, 9:2259 (RA;CA)
**Transients**
Dynamic flux synthesis with discontinuous trial functions, 9:2257 (RA;CA)

**CANIS LATRANS**
*See COYOTES*
**CAPACITORS**
Design
Design and construction of large capacitor banks, 9:4189 (R;US)
**CARBAZOLES**
Denitrification
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**CARBINOL**
*See METHANOL*
**CARBON**
*See also DIAMONDS*
*GRAPHITE*
Carbon 12 Reactions
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Chemical Reactions
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2908 (R;US)
Desorption
Angular distribution of desorpted atoms of solid surfaces, 9:2819 (RA;BR;In Spanish)
Ion Collisions
Dependence of multiple-scattering distributions on the charge states of fast ions exiting from solid targets, 9:3561 (J;US)
Iron 56 Reactions
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Neon 20 Reactions
$^{20}$Ne induced peripheral reaction at 30 MeV/nucleon, 9:3869 (R;FR)
Neutron Reactions
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
Charmed baryon Asub(c)sup(+) production by approximately 58 GeV neutrons on carbon, 9:3628 (R;SU)
Oxygen 16 Reactions
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Oxygen 18 Reactions
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Pion Minus Reactions
Differential cross section of eta meson production on carbon by $\pi^-$ mesons at the momentum of 3.3 GeV/c, 9:3632 (R;SU;In Russian)
Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$ N and $\pi^-$ C interactions at 40 GeV/c in different reference frames, 9:3630 (R;SU;In Russian)
Pion Plus Reactions
Inclusive production of direct photons in 200-GeV/c collisions, 9:3719 (J;US)
Proton Reactions
Inclusive production of direct photons in 200-GeV/c collisions, 9:3719 (J;US)
Quantity Ratio
Analysis by SIMS and AES of H:$TiO_2$ electrodes, 9:2887 (RA;BR;In Spanish)
**CARBON 11**
Isotope Production
Cross sections for the production of $^{11}$C in C targets by $^{12}$C at relativistic energies, 9:3879 (J;US)
Radiochemistry
Preparation of carbon 11-labelled radiopharmaceuticals by the use of HPLC method, 9:3350 (R;FR;In French)
**CARBON 12**
Hypernuclei
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Weak decay of lambda hypernuclei, 9:3639 (RA;US)
**CARBON 12 REACTIONS**
Compound Nuclei
Demonstration of a large deformation in the first stage of the sequence reaction $^{12}$C($^{28}$Si,$\alpha\alpha$)$^{32}$S(g.s.) by analysis of angular correlation measurements, 9:3883 (R;FR;In French)
Compound-Nucleus Reactions
Demonstration of a large deformation in the first stage of the sequence reaction $^{12}$C($^{28}$Si,$\alpha\alpha$)$^{32}$S(g.s.) by analysis of angular correlation measurements, 9:3883 (R;FR;In French)
Fragmentation
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Onset of damping in energetic heavy-ion interactions, 9:3897 (J;US)
Inclusive Interactions
Cross sections for the production of $^{11}$C in C targets by $^{12}$C at relativistic energies, 9:3879 (J;US)
Rutherford Scattering
Optical theorem and forward glory effects in heavy-ion scattering, 9:3942 (R;BR)
**CARBON 12 TARGET**
Carbon 12 Reactions
Cross sections for the production of $^{11}$C in C targets by $^{12}$C at relativistic energies, 9:3879 (J;US)
Kaon Minus Reactions
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Kaon Plus Reactions
Tests of the $K^+$-nucleon interaction in nuclei: an inelastic-scattering survey, 9:3873 (RA;US)
Nitrogen 14 Reactions
Projectile break-up of $^{14}$N at 62,7 MeV, 9:3870 (R;FR)
Pion Minus Reactions
Precompound analyses of spectra and yields following nuclear capture of stopped $\pi^-$, 9:3878 (J;US)
Pion Plus Reactions
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)
**CARBON 13**
Hypernuclei
Experiments with Λ hypernuclei, 9:3640 (RA;US)
How to populate bound hypernuclear levels, 9:3644 (RA;US)
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Measurement of $^{13}$C magnetic moment, 9:3641 (RA;US)
Isotope Effects
Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2971 (R;US)
NMR Spectra
CP/MAS $^{13}$C NMR spectroscopic study of chlorophyll a in the solid state, 9:3345 (R;US)
Nuclear Magnetic Resonance
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of metnionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)
Spin Exchange
$^{13}$C spin diffusion of adamantane, 9:2811 (J;US)
**CARBON 13 REACTIONS**
Fusion Reactions
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)
**CARBON 13 TARGET**
Carbon 13 Reactions
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)
Kaon Minus Reactions
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Pion Minus Reactions
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{13}$C by an optical potential and a collective model, 9:3882 (J;US)
Pion Plus Reactions
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{13}$C by an optical potential and a collective model, 9:3882 (J;US)
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)

**CARBON 14**
**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)
**Radiochemistry**
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3036 (R;DE;In German)
**CARBON 14 COMPOUNDS**
**Chemical Preparation**
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3036 (R;DE;In German)
**CARBON 14 REACTIONS**
**Transfer Reactions**
Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3893 (R;FR)
**CARBON COMPOUNDS**
*See also CARBON OXYSULFIDE*
*CARBON SULFIDES*
**Fluorescence**
Complete energy transfer map for $COF_2$ , 9:3578 (J;US)
**Molecule-Molecule Collisions**
Complete energy transfer map for $COF_2$ , 9:3578 (J;US)
**Vibrational States**
Complete energy transfer map for $COF_2$ , 9:3578 (J;US)
**CARBON DIOXIDE**
**Air-Water Interactions**
Climate-chemistry connection, 9:3257 (R;US)
**Atom-Molecule Collisions**
Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr, 9:3586 (J;US)
**Binary Mixtures**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983 (Methane, carbon dioxide, carbon monoxide, hydrogen: binary mixtures with organic solvents; ASPEN; also properties of pure organic solvents with equations), 9:1761 (R;US)
**Chemisorption**
Chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films, 9:2784 (J;US)
**Collisions**
Distribution of internal energy in CO and $CO_2$ vibrationally excited by a hot platinum surface, 9:3581 (J;US)
**Ecological Concentration**
Climate-chemistry connection, 9:3257 (R;US)
**Electron Drift**
Electron drift velocities in gas mixtures of He, $N_2$, and $CO_2$, 9:2863 (J;US)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Environmental Impacts**
Response to W.W. Kellogg carbon dioxide and climatic change: implications for mankind's future, 9:3268 (R;US)
**Infrared Spectra**
Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr, 9:3586 (J;US)
**Methanation**
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83, 9:2075 (R;US)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Phase Diagrams**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**Vibrational States**
Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr, 9:3586 (J;US)
**CARBON DIOXIDE INJECTION**
**Comparative Evaluations**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**CARBON DIOXIDE LASERS**
Combination ring cavity and backward raman waveguide amplifier, 9:3080 (P;US)
**Optical Pumping**
Development and study of the first-stage amplification unit of the TIR-1M $CO_2$-laser installation, 9:4072 (R;SU;In Russian)
**CARBON IONS**
**Ion-Atom Collisions**
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3509 (R;US)
**CARBON MONOXIDE**
**Adsorption**
Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2082 (J;US)
**Binary Mixtures**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983 (Methane, carbon dioxide, carbon monoxide, hydrogen: binary mixtures with organic solvents; ASPEN; also properties of pure organic solvents with equations), 9:1761 (R;US)
**Chemical Reaction Yield**
Molecular beam study of the photochemistry of $S_1$ glyoxal, 9:3008 (J;US)
**Chemisorption**
Chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films, 9:2784 (J;US)
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3053 (D;US)
**Collisions**
Distribution of internal energy in CO and $CO_2$ vibrationally excited by a hot platinum surface, 9:3581 (J;US)
**Desorption**
Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces, 9:2963 (J;US)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Energy-Level Transitions**
Two-photon excitation of the D $^1\Delta$—X $^1\Sigma^+$ transition in carbon monoxide, 9:3574 (J;US)
**Ion Emission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
**Methanation**
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2082 (J;US)
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Multi-Photon Processes**
Nonadiabatic approach for resonant molecular multiphoton absorption processes in intense infrared laser fields, 9:3545 (J;US)
**Oxidation**
Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3053 (D;US)
**Photoemission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
**Separation Processes**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)

**Ultrasonic Waves**
Vibrational relaxation of $UF_6$: Ultrasonic measurements in mixtures with CO, 9:2833 (J;US)
**Ultraviolet Spectra**
Two-photon excitation of the D $^1\Delta$—X $^1\Sigma^+$ transition in carbon monoxide, 9:3574 (J;US)

**CARBON OXIDE SULFIDE**
*See CARBON OXYSULFIDE*

**CARBON OXYSULFIDE**
**Chemical Reaction Kinetics**
Adiabatic and diabatic reactions of S($^1$D) atoms with OCS: Internal state distribution of the $S_2$ products, 9:2915 (J;US)

**CARBON SULFIDES**
**Hydrogenation**
Homogeneous hydrogenolysis of carbon disulfide catalyzed by a molybdenum dimer with sulfido ligands, 9:2937 (J;US)

**CARBON TETRACHLORIDE**
**Auger Electron Spectroscopy**
Auger spectra of tetrahedral halides and hydrides, 9:3568 (J;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)

**CARBON TETRAFLUORIDE**
**Auger Electron Spectroscopy**
Auger spectra of tetrahedral halides and hydrides, 9:3568 (J;US)

**CARBONIC ACID DERIVATIVES**
**Fluorescence**
Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene, 9:2986 (J;US)
**Radiationless Decay**
Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene, 9:2986 (J;US)

**CARBONYL SULFIDE**
*See CARBON OXYSULFIDE*

**CARBONYLS**
*Only for compounds of metals with carbonyl radicals.*
**Catalytic Effects**
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2070 (R;US)
**PH Value**
Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2955 (J;US)

**CARBOXYLASE**
**Biosynthesis**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3344 (R;US)
**Molecular Structure**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3344 (R;US)

**CARCINOGENESIS**
**Computer Codes**
Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital, 9:3421 (J;US)

**CARCINOMAS**
**Radiotherapy**
Electron beam therapy of breast carcinoma. Pt. 3. Early results, 9:3368 (RA;HU;In Hungarian, English)
Source localization with semiconductor detector in the intracavitary therapy, 9:3373 (RA;HU;In Hungarian, English)
Therapeutic effects of radiotherapy of carcinoma of corpus uteri and cervix in the years 1967-1972, 9:3355 (R;DE;In German)
Upper and lower half-body irradiation of patients with inoperable particellular bronchial carcinoma, 9:3371 (RA;HU;In Hungarian, German)

**CARNOT CYCLE**
**Thermodynamics**
Generalized Carnot cycle: A working fluid operating in finite time between finite heat sources and sinks, 9:3118 (J;US)

**CASCADE SOLAR CELLS**
**Research Programs**
Advanced photovoltaic concentrator cells. Final report, August 29, 1979-March 31, 1982, 9:2122 (R;US)

**CAST IRON**
**Brittleness**
Value/impact of design criteria for cast ductile iron shipping casks, 9:3067 (R;US)
**Ductility**
Value/impact of design criteria for cast ductile iron shipping casks, 9:3067 (R;US)

**CASTE (INSECTS)**
*See INSECTS*
*POPULATIONS*

**CATALYSTS**
**Chemical Preparation**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2070 (R;US)
**Deactivation**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Infrared Spectra**
Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3053 (D;US)
**Particle Size**
Catalyst size distributions from x-ray diffraction, 9:2946 (J;US)
**Poisoning**
Improvements to gas detection systems (Catalytic gas detectors), 9:1838 (BA;GB)
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Reduction**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
**Regeneration**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Scanning Electron Microscopy**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Sorptive Properties**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
**Structural Chemical Analysis**
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2070 (R;US)
**Sulfidation**
In situ laser Raman spectroscopy of the sulfiding of $Mo/\gamma$-$Al_2O_3$ catalysts, 9:2945 (J;US)
**Surface Area**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
**Transmission Electron Microscopy**
Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3053 (D;US)

**CATION EXCHANGE CAPACITY**
*See CATIONS*
*ION EXCHANGE*

**CATIONS**
*See also HYDROGEN IONS 1 PLUS*
*HYDROGEN IONS 2 PLUS*
**Membrane Transport**
Cation fluxes from binary $Ag^+$-M/sup n+/ mixtures in a $H_2O$-$CHCl_3$-$H_2O$ liquid membrane system containing a series of macrocyclic ligand carriers, 9:2904 (J;US)
Selective $M^+$-$H^+$ coupled transport of cations through a liquid membrane by macrocyclic calixarene ligands, 9:2903 (J;US)

**CATS**
**Blood Chemistry**
Ecology of exploited and unexploited bobcat population in southeastern Idaho, 9:3340 (RA;US)
**Ecology**
Ecology of exploited and unexploited bobcat population in southeastern Idaho, 9:3340 (RA;US)
**Population Dynamics**
Ecology of exploited and unexploited bobcat population in southeastern Idaho, 9:3340 (RA;US)
**CAVITY RESONATORS**
**Beam Dynamics**
Transverse beam cavity interaction. Pt. 2, 9:3130 (R;DE)
**CDC COMPUTERS**
**Performance**
Some predictions on the performance of future supercomputers for simulation and control, 9:4248 (R;US)
**CELL CULTURES**
**Radiosensitivity**
Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983, 9:3386 (R;US)
**CELL GROWTH (PLANT)**
*See PLANT CELLS*
**CELLS (PLANT)**
*See PLANT CELLS*
**CELLS (REACTOR)**
*See REACTOR CELLS*
**CELLULOSE**
**Enzymatic Hydrolysis**
Kinetic studies of enzymatic hydrolysis of insoluble cellulose: (II) analysis of extended hydrolysis times, 9:2126 (J;US)
**CEMENT INDUSTRY**
**Energy Conservation**
Energy saving in the production processes of the concrete industry, 9:2649 (R;FI;In Finnish)
**CENTRAL NUCLEAR EN ATUCHA REACTOR**
*See ATUCHA REACTOR*
**CERAMICS**
**Leaching**
Leach testing of INEL waste forms in a gamma field, 9:2022 (J;US)
**Radiation Effects**
Radiation damage in nuclear waste ceramics, 9:2788 (J;US)
**Sample Preparation**
Preparation of ceramic particulates for transmission electron microscopy, 9:2671 (BA;US)
**Stress Relaxation**
Stress-relaxation technique for deformation studies in four-point bend tests: application to polycrystalline ceramics at elevated temperatures, 9:2799 (J;GB)
**Transmission Electron Microscopy**
Preparation of particulates for transmission electron microscopy: an update, 9:2795 (BA;US)
**CERIUM 140 TARGET**
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)
**CERIUM 141**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**CERIUM 144**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**CERIUM ALLOYS**
**Electric Conductivity**
Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$, 9:2737 (J;US)
**Electron Spectroscopy**
Electron tunneling spectroscopy of intermediate valence materials, 9:2747 (BA;NL)
**Electronic Structure**
Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$, 9:2736 (J;US)
**Magnetization**
Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$, 9:2737 (J;US)
Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$, 9:2736 (J;US)
**CERIUM BORIDES**
**Form Factors**
Magnetic form factor measurements in cerium hexaboride, 9:2773 (R;US)
**CERMETS**
**Microstructure**
Preliminary electron microscopic study of thermal-shock-resistant ceramic-metal composites, 9:2804 (BA;US)
**Thermal Diffusivity**
Thermal diffusivities of molybdenum/alumina cermets, 9:2794 (J;US)
**Thermal Shock**
Preliminary electron microscopic study of thermal-shock-resistant ceramic-metal composites, 9:2804 (BA;US)
**CESIUM**
**Adsorption**
All-electron local-density theory of alkali-metal bonding on transition-metal surfaces: Cs on W(001), 9:2717 (J;US)
**Evaporation**
Study of selected off-gases produced during the immobilization of nuclear wastes in the SYNROC process. Final report for the year ended December 31, 1982, 9:2000 (R;US)
**Fermi Level**
Comment on "Prediction of Fermi-surface pressure dependence in Rb and Cs", 9:2732 (J;US)
**Filtration**
Testing of the filtration efficiency of a silica gel packing for capture of cesium aerosol, 9:1951 (RA;XA)
**Ion Exchange**
Ion exchange mechanism of cesium removal by cyanoferrates, 9:2042 (B;GB)
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)
**CESIUM 134**
**Evaporation**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**CESIUM 137**
**Evaporation**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
**Radioecological Concentration**
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**CESIUM 146**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)

**CESIUM 147**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**CESIUM CARBIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Structural Chemical Analysis**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**CESIUM CHLORIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Chemical Reactions**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Creep**
Activation volume for steady state creep in polycrystalline CsCl: cesium chloride structure, 9:2755 (BA;US)
**Exchange Interactions**
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
**Neutron Diffraction**
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
**Order Parameters**
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
**CESIUM IONS**
**Confinement**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. I. Experiment, 9:3442 (J;US)
**Mass Resolution**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. II. Theory, 9:1919 (J;US)
**CESIUM ISOTOPES**
*See also CESIUM 134*
*CESIUM 137*
*CESIUM 146*
*CESIUM 147*
**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)
**CEYLON**
*See SRI LANKA*
**CHALKS**
*See LIMESTONE*
**CHANNELING**
*See also ION CHANNELING*
Some specific features of coherent radiation and particle propagation in crystals, 9:2823 (R;SU;In Russian)
**CHARCOAL**
**Availability**
Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway), 9:2088 (R;NO;In Norwegian)
**By-Products**
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
**Economic Analysis**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2071 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2646 (R;NO;In Norwegian)
**Energy Efficiency**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2071 (R;NO;In Norwegian)
**Energy Source Development**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2071 (R;NO;In Norwegian)
**Production**
Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway), 9:2088 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
Pyrolysis tests with Cornell retort in production of charcoal, 9:2089 (R;NO;In Norwegian)
**Trade**
Charcoal as an alternative energy carrier. Pt. 5: Systems studies in the region of Elverum (Norway), 9:2088 (R;NO;In Norwegian)
**Uses**
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
Charcoal based $CO_2$-generator for use in greenhouses, 9:2644 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - possible use, 9:2645 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2646 (R;NO;In Norwegian)
**CHARGING (REACTOR)**
*See REACTOR FUELING*
**CHARM PARTICLES**
**Particle Production**
Hadronic heavy flavour production from the $2 \rightarrow 3$ QCD subprocess, 9:3754 (R;SU)
**Reviews**
Charm physics at the SPS; Now until approximately 1990, 9:3614 (RA;XC)
**CHARMONIUM**
**Energy Levels**
Study of charmonium states, 9:3654 (RA;US)
**Particle Production**
New horizons in nuclear physics, 9:3858 (RA;US)
**CHARPAK CHAMBERS**
*See MULTIWIRE PROPORTIONAL CHAMBERS*
**CHARS**
**Activation Energy**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Reactivity**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Surface Area**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Surface Properties**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**CHEMICAL ACTIVITY**
*See THERMODYNAMIC ACTIVITY*
**CHEMICAL EFFLUENTS**
**Chemical Properties**
Systems for testing and hazard evaluation of chemicals in the aquatic environment - ESTHER. A background paper and a programme outline as a basis for the research plan in preparation, 9:3326 (R;SE)
**Environmental Impacts**
Effect of effluent from a nitrogen fertilizer factory and a pulp mill on the distribution and abundance of Aeromonas hydrophila in Albemarle Sound, North Carolina, 9:3381 (J;US)
**Hazards**
Systems for testing and hazard evaluation of chemicals in the aquatic environment - ESTHER. A background paper and a programme outline as a basis for the research plan in preparation, 9:3326 (R;SE)
**CHEMICAL EXPLOSIVES**
*See also PETN*
**Chemical Reaction Kinetics**
LARC: computer codes for Lagrangian analysis of stress-gauge data to obtain decomposition rates through correlation to thermodynamic variables, 9:3222 (R;US)
**CHEMICAL LASERS**
FIR laser-development program. Final report, 9:4041 (R;US)

**Laser Mirrors**
Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report, 9:3076 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report, 9:3077 (R;US)
**Mathematical Models**
Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report, 9:3076 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report, 9:3077 (R;US)
**Windows**
Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report, 9:3076 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report, 9:3077 (R;US)

**CHEMICAL REACTION KINETICS**
**Analytical Solution**
Reactive-diffuse systems with Arrhenius kinetics: multiple solutions, ignition and extinction, 9:2970 (J;US)
**Oscillations**
Analysis of periodic perturbations of limit cycles, 9:2950 (J;US)
**Quantum Mechanics**
Quantum mechanical rate constants for bimolecular reactions, 9:2914 (J;US)
Reaction-path dynamics for polyatomic systems, 9:3557 (J;US)

**CHEMICAL REACTORS**
**Deposits**
Evaluation of coking behavior in coal liquefaction process equipment, 9:1776 (J;US)
**Fluid Mechanics**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Mathematical Models**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Multiphase Flow**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Scaling Laws**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Temperature Distribution**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)

**CHEMICALS**
*See DYES*
*SURFACTANTS*
*TUMOR PROMOTERS*

**CHEMILUMINESCENCE**
**Probes**
Infrared fluorescence: a versatile probe of state-selected chemical dynamics, 9:2958 (J;US)
**Uses**
Infrared fluorescence: a versatile probe of state-selected chemical dynamics, 9:2958 (J;US)

**CHEMISTRY**
*See also NUCLEAR CHEMISTRY*
**Research Programs**
Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983 (Oak Ridge National Laboratory), 9:4237 (R;US)

**CHIRAL SYMMETRY**
**Symmetry Breaking**
Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics, 9:3817 (J;US)

**CHLOR-ALKALI INDUSTRY**
*See CHLORINE*

**CHLORINATED ALIPHATIC HYDROCARBONS**
*See also CARBON TETRACHLORIDE*
**Chemical Reactions**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy, 9:1899 (BA;GB)

**CHLORINATED AROMATIC HYDROCARBONS**
**Solvent Extraction**
Pilot-plant studies for solvent extraction of polychlorinated biphenyl (PCB), 9:3106 (R;US)

**CHLORINE**
**Biological Effects**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)
**Chemical Reaction Kinetics**
Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+\ ^{35}Cl$, 9:2943 (J;US)
**Excitation**
Sensitive, non-intrusive point diagnostic for atomic chlorine using coherent anti-Stokes Raman scattering, 9:2967 (J;NL)
**Raman Spectra**
Sensitive, non-intrusive point diagnostic for atomic chlorine using coherent anti-Stokes Raman scattering, 9:2967 (J;NL)

**CHLORINE 35 TARGET**
**Alpha Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Deuteron Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Proton Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)

**CHLORINE 37**
**Isotope Effects**
Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+\ ^{35}Cl$, 9:2943 (J;US)

**CHLORINE 37 TARGET**
**Alpha Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Deuteron Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Proton Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)

**CHLORINE CHLORIDES**
*See CHLORINE*

**CHLORINE ISOTOPES**
*See also CHLORINE 37*
**Alpha Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Deuteron Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Proton Reactions**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)

**CHLOROPHYLL**
**NMR Spectra**
CP/MAS $^{13}C$ NMR spectroscopic study of chlorophyll a in the solid state, 9:3345 (R;US)

**Structural Chemical Analysis**
Aggregation of the bacteriochlorophylls c, d, and e. Models for the antenna chlorophylls of green and brown photosynthetic bacteria, 9:2992 (J;US)

**CHROMIUM**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Dissociation Energy**
Preparation and reactions of $Cr^-$. The Cr-H bond strength, 9:3029 (J;US)
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)

**CHROMIUM 51**
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)

**CHROMIUM COMPLEXES**
**Excitation**
Preparation and reactions of $Cr^-$. The Cr-H bond strength, 9:3029 (J;US)
**Radiolysis**
Preparation and reactions of $Cr^-$. The Cr-H bond strength, 9:3029 (J;US)

**CHROMIUM OXIDES**
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)

**CHROMIUM-MOLYBDENUM STEELS**
*See also ALLOY-HT-9*
**Corrosion**
Long term corrosion of Cr-Mo steels in superheated steam at 482 and 538 C, 9:2743 (J;US)
**Creep**
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
**Deformation**
Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983 (Cr-Mo-V rotor steel), 9:2675 (R;US)
**Fatigue**
Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen (34CrMo4; 40Mn4), 9:2750 (TG;US)
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2674 (R;US)
**Hydrogen Embrittlement**
Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen (34CrMo4; 40Mn4), 9:2750 (TG;US)
Investigation of hydrogen embrittlement of steels for hydrogen flasks and pressure vessels, 9:2681 (R;XE;GE)
**Physical Radiation Effects**
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)

**CHROMODYNAMICS**
*See QUANTUM CHROMODYNAMICS*

**CISTRONS**
*See GENES*

**CITIES**
*See URBAN AREAS*

**CLATHRATES**
**Neutron Diffraction**
Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite, 9:2779 (J;US)
**Phonons**
Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite, 9:2779 (J;US)
**Production**
Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82, 9:2517 (R;US)

**CLAYS**
*See also BENTONITE*
**Acidification**
Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations, 9:3285 (R;US)

**CLIMATES**
**Computerized Simulation**
Aggregation of U.S. population centers into climate regions, 9:2096 (BA;US)
**Feedback**
Response to W.W. Kellogg carbon dioxide and climatic change: implications for mankind's future, 9:3268 (R;US)
**Geologic History**
Climate-chemistry connection, 9:3257 (R;US)
**Mathematical Models**
Evaporation-limited tropical temperatures as a constraint on climate sensitivity, 9:3255 (J;US)
**Regional Analysis**
Aggregation of U.S. population centers into climate regions, 9:2096 (BA;US)

**CLINCH RIVER BREEDER REACTOR**
**After-Heat Removal**
Probabilistic methods for accident progression analysis, 9:2498 (BA;US)
**Environmental Effects**
Environmental effects of the Clinch River Breeder Reactor fuel cycle, 9:2288 (J;US)
**Fuel Cycle**
Environmental effects of the Clinch River Breeder Reactor fuel cycle, 9:2288 (J;US)
**Loss of Flow**
Post-initiating phase neutronics analysis of an unprotected LOF event in CRBR, 9:2461 (J;US)
Results of SIMMER-II analysis of fuel migration through the gap between internal fuel element clusters in heterogeneous cores, 9:2502 (B;DE;In German)
**Reactor Safety**
Results of SIMMER-II analysis of fuel migration through the gap between internal fuel element clusters in heterogeneous cores, 9:2502 (B;DE;In German)
**Transients**
A momentum integral network method for thermal-hydraulic transient analysis, 9:2464 (J;US)

**CLOUDS**
*Limited to clouds in the earth atmosphere; for interstellar clouds see COSMIC DUST or COSMIC GASES.*
**Light Scattering**
Scattering and absorption of light by soot particles, 9:4014 (R;US)

**CLUSTERS (FUEL ELEMENTS)**
*See FUEL ELEMENT CLUSTERS*

**CLUSTERS (GALAXY)**
*See GALAXY CLUSTERS*

**CLUSTERS (ION)**
*See ION PAIRS*

**CNA REACTOR**
*See ATUCHA REACTOR*

**CO2 FLOODING**
*See CARBON DIOXIDE INJECTION*

**COAL**
*See also SUBBITUMINOUS COAL*

**Chemical Reactions**
Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83, 9:1787 (R;US)
**Cleaning**
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1798 (R;US)
**Combustion**
Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981, 9:3108 (R;US)
Solid fuels technology in the 80s, 9:2091 (R;SE;In Swedish)
**Combustion Control**
Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982, 9:1791 (R;US)
**Combustion Properties**
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples (Finland), 9:2093 (R;FI;In Finnish)
**Comparative Evaluations**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2556 (R;FI;In Finnish)
**Dissolution**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1763 (R;US)
Dissolution of coal in solvents, 9:1777 (D;US)
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Fuel Slurries**
Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981, 9:3108 (R;US)
Development and evaluation of coal-water mixture combustion technology. Phase I. Second quarterly report, 11 January 1981-10 April 1981, 9:3109 (R;US)
**Grinding**
Development and evaluation of coal-water mixture combustion technology. Phase I. Second quarterly report, 11 January 1981-10 April 1981, 9:3109 (R;US)
**Hydrogenation**
High pressure hydrogenation of solid fuels, 9:1775 (R;FI;In Finnish)
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Information Systems**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1783 (R;US)
**Macerals**
Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1781 (R;US)
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1783 (R;US)
**Market**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**Moisture**
Moisture determination by microwave heating, 9:1788 (R;US)
**Molecular Structure**
Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83, 9:1787 (R;US)
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**New Mexico**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Pyrolysis**
Laser micropyrolysis of coal macerals. Final report Oct 79-Mar 83, 9:1772 (R;US)
Synthesis and study of polymer models representative of coal structure. Final report Feb 82-Mar 83, 9:1787 (R;US)
**Storage**
Development of techniques for obtaining and storing premium coal samples. Annual report 1 Mar-28 Feb 83, 9:1807 (R;US)
**Structural Chemical Analysis**
Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1781 (R;US)
**Structural Models**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Trade**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**Waste Product Utilization**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)

**COAL DEPOSITS**
*See also COAL SEAMS*
**Geological Surveys**
Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82, 9:1890 (R;US)
**Hydraulic Fracturing**
Containment of hydraulic fractures in coal seams by in situ stresses, 9:1801 (RA;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)

**COAL GASIFICATION**
*See also EXXON GASIFICATION PROCESS*
*LURGI SLAGGING PROCESS*
*PEATGAS PROCESS*
*U-GAS PROCESS*
*WESTINGHOUSE GASIFICATION PROCESS*
Reduction gas and artificial gas from Rhine crude lignite by application of tube furnace gas generator, 9:1768 (R;DE;In German)
**Catalysts**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Chemical Reaction Kinetics**
Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78, 9:1774 (R;US)
**Efficiency**
IGCC performance comparison for variations in gasifier type and gas turbine firing temperature, 9:2187 (R;US)
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)
**Hot Gas Cleanup**
Desulfurization of hot reductive gases by means of metal oxides, 9:1767 (R;DE;In German)
**Process Solutions**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)
**Technology Assessment**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)
**Waste Water**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)

**COAL GASIFICATION PLANTS**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**Monitoring**
Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1799 (R;US)

**COAL INDUSTRY**
**International Cooperation**
Information on the operation of the International Energy Agency's Coal Industry Advisory Board, 9:2555 (R;US)
**COAL LIQUEFACTION**
*See also H-COAL PROCESS*
*SASOL PROCESS*
*SRC-II PROCESS*
**Catalysts**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1763 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Chemical Reaction Kinetics**
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Chemistry**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1766 (R;US)
**Data Base Management**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**Organic Solvents**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1763 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)
**Process Solutions**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)
**Research Programs**
Fossil energy, 9:1769 (RA;US)
**Waste Water**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)
**COAL LIQUEFACTION PLANTS**
**Distillation Equipment**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Economic Analysis**
Parametric cost analysis for advanced energy concepts, 9:1752 (R;US)
**Materials**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Monitoring**
Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1799 (R;US)
**Valves**
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1753 (R;US)
**COAL LIQUIDS**
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Chemical Analysis**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Chemical Composition**
Effects of hydrotreatment on the composition of mutagenic fractions of a coal-derived petroleum substitute, 9:1782 (R;US)
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Coking**
Evaluation of coking behavior in coal liquefaction process equipment, 9:1776 (J;US)
**Denitrification**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Desulfurization**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Distillation**
Nonstandard aging tests on coal-derived distillate fuel. Final report, July 7, 1981-July 6, 1983, 9:1760 (R;US)
**Fractionation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids, 9:1811 (R;US)
**Infrared Spectra**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Liquid Column Chromatography**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Metabolic Activation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids, 9:1811 (R;US)
**Nuclear Magnetic Resonance**
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
**Physical Properties**
Fossil energy, 9:1769 (RA;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Stability**
Nonstandard aging tests on coal-derived distillate fuel. Final report, July 7, 1981-July 6, 1983, 9:1760 (R;US)
**Supercritical Gas Extraction**
Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)
**Thermal Cracking**
Dissolution of coal in solvents, 9:1777 (D;US)
**Thermodynamic Properties**
Development of a thermodynamic-properties correlation framework for the coal-conversion industry. Final report, September 1, 1980-August 31, 1983, 9:1784 (R;US)
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**Toxicity**
Acute toxicity of water soluble fractions derived from a coal liquid (SCR-II) to three aquatic organisms, 9:3418 (J;NL)
**Vapor Pressure**
High P/T phase and volumetric behavior of coal-liquid constituents. Quarterly report, July 1, 1983-September 30, 1983 (Coal liquid model compounds), 9:1786 (R;US)

COAL MINING
Dusts
Evaluation of novel coal cutting concepts for reduced dust generation. Open file report 28 Sep 79-7 Jan 81, 9:1804 (R;US)
Evaluation
Evaluation of novel coal cutting concepts for reduced dust generation. Open file report 28 Sep 79-7 Jan 81, 9:1804 (R;US)
Mineral Wastes
Physical property data on coarse anthracite waste. Report of investigations, 9:1795 (R;US)
Occupational Safety
Mines Safety and Health Commission for the mining and other extractive industries. Its role in oil and gas exploration and extraction, 9:1847 (BA;GB)
Regulations
Addition of coal mining regulations to the Computer-Aided Environmental Legislative Data System (CELDS). Final report, 9:1812 (R;US)
COAL PREPARATION
Cost Benefit Analysis
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1798 (R;US)
Desulfurization
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1798 (R;US)
Mineral Wastes
Physical property data on coarse anthracite waste. Report of investigations, 9:1795 (R;US)
COAL PREPARATION PLANTS
Noise Pollution Abatement
Demonstrating the noise control of a coal preparation plant. Volume 2: long term treatment evaluation. Open file report Oct 77-Aug 81, 9:1806 (R;US)
Noise Pollution Control
Demonstrating the noise control of a coal preparation plant. Volume 2: long term treatment evaluation. Open file report Oct 77-Aug 81, 9:1806 (R;US)
COAL SEAMS
Degassing
Evaluation of gas producing potential from unmineable coal seams, 9:1877 (RA;US)
Information Systems
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1783 (R;US)
Thickness
Evaluation of gas producing potential from unmineable coal seams, 9:1877 (RA;US)
COAL-DERIVED LIQUIDS
*See COAL LIQUIDS*
COAL-FIRED MHD GENERATORS
*See also MHD GENERATOR CDIF*
Combustors
Coal-fired MHD Combustor Development Project. Phase IIIC. First quarterly technical progress report, 1 July-30 September 1983, 9:2583 (R;US)
Coal-fired MHD combustor development project: Phase IIIA. Final technical report, 9:2582 (R;US)
COAL-OIL MIXTURES
*See COAL*
*FUEL OILS*
*FUEL SLURRIES*
COATED FUEL PARTICLES
Fuel Element Failure
Fuel performance models for high-temperature gas-cooled reactor core design, 9:2239 (R;US)
Performance Testing
Irradiation performance of LEU fuel particle designs, 9:2247 (J;US)
TRISO-coated HTGR fuel pressure-vessel performance models, 9:2238 (R;US)
Radionuclide Migration
Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2435 (R;DE;In German)
Stress Analysis
TRISO-coated HTGR fuel pressure-vessel performance models, 9:2238 (R;US)
COBALT
Biological Accumulation
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
Catalytic Effects
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
Ecological Concentration
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
COBALT 58
Tissue Distribution
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
COBALT 60
Tissue Distribution
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
Uptake
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
COBALT ALLOYS
Catalytic Effects
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
COBALT CHLORIDES
Exchange Interactions
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
Neutron Diffraction
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
Order Parameters
Neutron scattering study of a one-dimensional XY antiferromagnet $Cs_2CoCl_4$, 9:2841 (J;US)
COBALT COMPLEXES
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
Photochemical Reactions
Reactions of bis(dimethylglyoximato)cobalt(II) complexes with tert-butyl hydroperoxide, 9:2979 (J;US)
COBALT FLUORIDES
Crystal-Phase Transformations
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/$F_2$, 9:2854 (J;US)
Ising Model
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/$F_2$, 9:2854 (J;US)
Neutron Diffraction
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/$F_2$, 9:2854 (J;US)
COBALT OXIDES
Catalytic Effects
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
COGENERATION
*Prior to November 1980, this concept was indexed to CO-GENERATION.*
*See COGENERATION*
Research Programs
Department of Energy programs on cogeneration and their economics, 9:2548 (BA;US)
COGENERATION PLANTS
*See DUAL-PURPOSE POWER PLANTS*

**COILS (MAGNETIC)**
*See MAGNET COILS*
**COKE**
**Moisture**
Moisture determination by microwave heating, 9:1788 (R;US)
**Sorptive Properties**
Reduction of nitrogen monoxide by catalytically activated lignite coke, 9:1792 (R;DE;In German)
**COLD STORAGE**
Assessment of cool storage in commercial building applications, 9:2614 (R;US)
**COLLECTRONS**
*See SELF-POWERED NEUTRON DETECTORS*
**COLLISIONLESS PLASMA**
**Electric Currents**
Analysis of current drive by travelling wave based on theory of intrinsic stochasticity, 9:4065 (R;JP)
**COLOGNE SPIRITS**
*See ETHANOL*
**COLON**
*See LARGE INTESTINE*
**COLONIES**
*See POPULATIONS*
**COLORIMETRY**
*See ABSORPTION SPECTROSCOPY*
**COLUMBIUM**
*See NIOBIUM*
**COLUMN PACKING**
**Standards**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material, 9:3075 (B;US)
**COLUMNS (MECHANICAL)**
*See MECHANICAL STRUCTURES*
**COMBINED GAS AND STEAM CYCLE POWER PLANTS**
*See COMBINED-CYCLE POWER PLANTS*
**COMBINED STEAM-POWER GENERATION**
*See COGENERATION*
**COMBINED-CYCLE POWER PLANTS**
*Prior to March, 1976, the descriptors COMBINED CYCLES and FOSSIL-FUEL POWER PLANTS or THERMAL POWER PLANTS were used for indexing this concept.*
**Coal Gasification**
Experimental simulation and advanced control aspects of the IGCC concept. Part I. Simulation results, 9:1751 (R;US)
**Performance Testing**
IGCC performance comparison for variations in gasifier type and gas turbine firing temperature, 9:2187 (R;US)
**COMBUSTION**
**Laser Spectroscopy**
Progress Report 1980-81-82, 9:3050 (R;SE)
**Raman Spectroscopy**
Broadband rotational CARS spectra of simple gases of interest in combustion diagnostics, 9:3049 (R;SE)
**Vortices**
Flame acceleration mechanisms under conditions of partial confinement. Annual report no. 2, Feb 82-Jan 8, 9:3051 (R;US)
**COMBUSTORS**
*See also FLUIDIZED-BED COMBUSTORS*
**Design**
Coal-fired MHD Combustor Development Project. Phase IIIC. First quarterly technical progress report, 1 July-30 September 1983, 9:2583 (R;US)
Coal-fired MHD combustor development project: Phase IIIA. Final technical report, 9:2582 (R;US)
**Fuel Substitution**
Direct combustion of industrial dry, composite waste in suspension. Final report, 9:2642 (R;US)
**Performance Testing**
Coal-fired MHD Combustor Development Project. Phase IIIC. First quarterly technical progress report, 1 July-30 September 1983, 9:2583 (R;US)
Coal-fired MHD combustor development project: Phase IIIA. Final technical report, 9:2582 (R;US)
**COMETS**
**Origin**
Formation of comets by radiation pressure in the outer protosun. II. Dependence on the radiation-grain coupling, 9:3469 (J;US)
Formation of comets by radiation pressure in the outer protosun. III. Dependence on the anisotropy of the radiation field, 9:3470 (J;US)
**COMMERCIAL BUILDINGS**
**Fuel Cell Power Plants**
Economic competitiveness of fuel cell onsite integrated energy systems, 9:2584 (R;US)
**Ventilation Systems**
Energy conservation of ventilation in commercial and public buildings. Basis. Method file, 9:2612 (R;FI;In Finnish)
**COMMERCIAL SECTOR**
**Energy Analysis**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
**Radioactive Waste Disposal**
Regional low-level radioactive waste disposal sites: progress being made but new sites will probably not be ready by 1986, 9:2051 (R;US)
**COMMON MARKET**
**Energy Policy**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**COMPACT TORUS**
*Prior to October 1982, this concept was indexed to THERMONUCLEAR DEVICES or to a particular experiment if known, e.g., REVERSE-FIELD PINCH.*
**Reverse-Field Pinch**
Compact-Toroid Fusion Reactor (CTOR) based on the field reversed theta pinch, 9:4205 (BA;XA)
**Theta Pinch**
Compact-Toroid Fusion Reactor (CTOR) based on the field reversed theta pinch, 9:4205 (BA;XA)
**COMPOSITE MATERIALS**
*See also CERMETS*
**Energy Losses**
Viscoelastic loss characteristics of cord rubber composites, 9:2802 (R;US)
**Fabrication**
Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2806 (BA;US)
**Phase Studies**
Phase identification in $TiB_2Ni$ composites by analytical electron microscopy, 9:2797 (BA;US)
**Synthesis**
Preparation of high-temperature oxide-metal eutectic composites: a review, 9:2805 (J;US)
**COMPOSITE MODELS**
*See also QUARK MODEL*
**Gauge Invariance**
Family gauge symmetry from a composite model, 9:3785 (J;NL)
**Quantum Field Theory**
Relation $mr << 1$ in the preon model, 9:3825 (R;XA)
**Symmetry Breaking**
Relation $mr << 1$ in the preon model, 9:3825 (R;XA)
**COMPOUNDS (ORGANIC)**
*See ORGANIC COMPOUNDS*
**COMPTON EFFECT**
**Cross Sections**
Angle-averaged Compton cross sections, 9:3536 (R;US)
**COMPTON SCATTERING**
*See COMPTON EFFECT*
**COMPUTED TOMOGRAPHY**
*See COMPUTERIZED TOMOGRAPHY*
**COMPUTER CODES**
*Computer codes are indexed by their initial letter and CODES, e.g., A CODES. If the code name begins with a number the code is indexed to NUMBER CODES.*
*See also B CODES*

**C Codes**
Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine, 9:3117 (R;US)
**D Codes**
DNAF-1: an analytical fallout prediction model and code. Final report 12 Mar 80-31 Oct 81, 9:3225 (R;US)
Multidomain, multirecord-type Datatrieve-11 databases, 9:4255 (R;US)
**G Codes**
GIN: integrated navigation and data acquisition system, 9:1816 (BA;GB)
**L Codes**
LARC: computer codes for Lagrangian analysis of stress-gauge data to obtain decomposition rates through correlation to thermodynamic variables, 9:3222 (R;US)
**M Codes**
Derivation of I/M benefits for pre-1981 light duty vehicles for low altitude, non-California areas, 9:2669 (R;US)
**N Codes**
Numerical electromagnetics code - method of moments. User's guide supplement for NEC-3 for modeling buried wires, 9:3101 (R;US)
**R Codes**
Oak Ridge National Laboratory ELMO Bumpy Torus radially resolved, time-dependent, one-dimensional transport code - user's guide, 9:4075 (R;US)
**S Codes**
Fault tree as a tool in safety analysis of nuclear power plants (SIFTA code), 9:2420 (RA;CA)
Use of the SYVAC computer code in assessing a nuclear fuel waste disposal concept, 9:1971 (RA;CA)
**T Codes**
One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program, 9:2406 (R;US)
The TCLUST1 transient LMFBR intersubassembly heat transfer code, 9:2295 (J;US)
**W Codes**
WHISTBT: a 1-1/2-D radial-transport code for bumpy tori, 9:4074 (R;US)
**Z Codes**
Models and codes for the plasma edge region (Zephyr code), 9:4038 (R;GB)
**COMPUTER PROGRAMMING**
*See PROGRAMMING*
**COMPUTER PROGRAMS**
*See COMPUTER CODES*
**COMPUTER-AIDED DESIGN**
**Mathematical Models**
Some technical issues in geometric modeling, 9:4244 (R;US)
**Planning**
EE/NESD computer-aided engineering FY '84 plan, 9:4245 (R;US)
**COMPUTER-AIDED MANUFACTURING**
**Mathematical Models**
Some technical issues in geometric modeling, 9:4244 (R;US)
**COMPUTERIZED TOMOGRAPHY**
*An imaging technique in which transmission measurements of a narrow beam of rays, photons, or particles made at several different angles around an object may be used with a computer program to obtain a clear image of one plane*
**Contrast Media**
Application of contrast media in computer tomography, 9:3359 (RA;HU;In Hungarian, German)
**COMPUTERS**
*See also CDC COMPUTERS*
*CRAY COMPUTERS*
*MICROPROCESSORS*
**Uses**
Computations in plasma physics, 9:4123 (J;US)
High-energy physics, 9:3609 (J;US)
**CONCENTRATOR SOLAR CELLS**
*Prior to July, 1979 SOLAR CELLS or specific solar cells descriptors and SOLAR CONCENTRATORS were used to index this concept.*
**Fresnel Lens**
Linear Fresnel lens photovoltaic concentrator program, 9:2119 (R;US)
**Performance Testing**
Linear Fresnel lens photovoltaic concentrator program, 9:2119 (R;US)
**Research Programs**
Advanced photovoltaic concentrator cells. Final report, August 29, 1979-March 31, 1982, 9:2122 (R;US)
**CONCRETES**
*See also PRESTRESSED CONCRETE*
**Creep**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)
**Leaching**
Nuclear waste management, 9:1993 (RA;US)
**Matrix Materials**
Nuclear waste management, 9:1993 (RA;US)
**Mechanical Tests**
Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas, 9:1834 (BA;GB)
**Solidification**
Nuclear waste management, 9:1993 (RA;US)
**Tensile Properties**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)
**Waste Product Utilization**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)
**CONDENSED AROMATICS**
*See also BENZANTHRACENE*
*BENZOPYRENE*
*FLUORENE*
*NAPHTHALENE*
*PERYLENE*
*PYRENE*
**Photochemical Reactions**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983 (9-phenylanthracene), 9:3001 (R;US)
**CONDENSED CYCLOALKANES**
**Infrared Spectra**
Infrared photochemistry of specifically deuterated bicyclopropyl. A direct test of statistical unimolecular rate theory applied to branching ratios in multiphoton dissociation, 9:3013 (J;US)
**Photolysis**
Infrared photochemistry of specifically deuterated bicyclopropyl. A direct test of statistical unimolecular rate theory applied to branching ratios in multiphoton dissociation, 9:3013 (J;US)
**CONDENSER COOLING SYSTEMS**
**Leaks**
Helium approach to leak detection, 9:2189 (J;US)
**CONDENSERS (ELECTRIC)**
*See CAPACITORS*
**CONDUCTIVITY (THERMAL)**
*See THERMAL CONDUCTIVITY*
**CONING**
*See CHANNELING*
**CONSERVATION (ENERGY)**
*See ENERGY CONSERVATION*
**CONSTRUCTION INDUSTRY**
**Energy Conservation**
Energy saving in the production processes of the concrete industry, 9:2649 (R;FI;In Finnish)
**CONSUMER PROTECTION**
**Financial Assistance**
Consumer-related energy activities in Illinois. Final report, October 1, 1977-December 31, 1981, 9:2564 (R;US)
**CONTACT RADIOTHERAPY**
*See RADIOTHERAPY*
**CONTACTS (ELECTRIC)**
*See ELECTRIC CONTACTS*
**CONTAINERS**
*See also PRESSURE VESSELS*
*REACTOR VESSELS*
*TANKS*

**Design**
Versatile sample chamber for neutron scattering work at high and low temperatures, 9:3196 (J;US)
Waste packages for high-level waste repositories, 9:2014 (J;US)
**Fabrication**
Versatile sample chamber for neutron scattering work at high and low temperatures, 9:3196 (J;US)
**CONTAINMENT BUILDINGS**
**Equipment**
Research on equipment survival in a hydrogen burn, 9:2453 (R;US)
**Heat Transfer**
High pressure melt ejection, 9:2449 (R;US)
**Hydraulics**
High pressure melt ejection, 9:2449 (R;US)
**Impact Strength**
Study on the design basis accident 'aircraft impact on nuclear power plant', 9:2410 (R;DE;In German)
**Test Facilities**
High pressure melt ejection, 9:2449 (R;US)
**CONTAINMENT SYSTEMS**
**Computerized Simulation**
PRESCON-2 simulation of the OECD/CSNI containment analysis standard problem no. 2, 9:2421 (RA;CA)
**Leak Testing**
American National Standard: containment-system leakage-testing requirements, 9:2211 (B;US)
**Standards**
American National Standard: containment-system leakage-testing requirements, 9:2211 (B;US)
**CONTAMINATION (INTERNAL)**
*See RADIONUCLIDE KINETICS*
**CONTAMINATION (SURFACE)**
*See SURFACE CONTAMINATION*
**CONTINENTAL SHELF**
**Water Currents**
Effects of continental slope on the mean shelf circulation, 9:3441 (J;US)
Self-advection of density perturbations on a sloping continental shelf, 9:3439 (J;US)
**CONTROL ELEMENTS**
**Nondestructive Analysis**
Results of the poolside nondestructive examination of irradiated control blades removed from BWRs, 9:2341 (J;US)
**CONTROL RODS**
*See CONTROL ELEMENTS*
**CONTROL ROOMS**
**Communications**
Improvements and standardization of communication means for control room personnel in nuclear power plants, 9:2338 (R;DE;In German)
**CONTROL SYSTEMS**
*For automated processes including feedback.*
*See also ON-LINE CONTROL SYSTEMS*
**Design**
Automated underwater wellhead, 9:1839 (BA;GB)
**Industrial Radiography**
Radioisotope applications in industry. Part 2: Practical applications, 9:3189 (R;AT;In German)
**Performance Testing**
Automated underwater wellhead, 9:1839 (BA;GB)
**CONTROL THEORY (REACTOR)**
*See REACTOR KINETICS*
**CONVERTERS (ANALOG-DIGITAL)**
*See ANALOG-TO-DIGITAL CONVERTERS*
**COOLANT CLEANUP SYSTEMS**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)
**COOLANT-FUEL INTERACTIONS**
*See FUEL-COOLANT INTERACTIONS*
**COOLANTS**
*See also specific coolant materials.*
**Flow Rate**
Flow test for the full scale core mockup of the KUHFR, (1). Velocity distribution and pressure loss in the core, 9:2385 (R;JP;In Japanese)
**Humidity**
Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2242 (R;XA)
**COOLERS**
*See HEAT EXCHANGERS*
**COOLING LOAD**
**Data Compilation**
Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices, 9:2608 (R;US)
**COOLING SYSTEM (REACTOR)**
*See REACTOR COOLING SYSTEMS*
**COOLING SYSTEMS**
*See also CONDENSER COOLING SYSTEMS*
*REACTOR COOLING SYSTEMS*
**Technology Assessment**
Assessment of cool storage in commercial building applications, 9:2614 (R;US)
**COOLING TOWERS**
*See also NATURAL DRAFT COOLING TOWERS*
**Microorganisms**
Legionella oakridgensis: unusual new species isolated from cooling tower water, 9:3380 (J;US)
**COOPERATIVES**
*To be used in coordination with pertinent industry or utility.*
**Taxes**
Legislation needed to improve administration of tax exemption provisions for electric cooperatives, 9:2527 (R;US)
**COPPER**
**Absorption Spectra**
Extended x-ray absorption fine structure studies of diffused copper impurities in ZnSe, 9:2838 (J;US)
Spectroscopic studies of the jet-cooled copper trimer, 9:3541 (J;US)
**Atom-Atom Collisions**
Concerning a long-lived ($^3$P/sup e/)He$^-$ state: Lifetime and energy-level measurements of He$^-$, 9:3562 (J;US)
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Biological Effects**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
Onset of damping in energetic heavy-ion interactions, 9:3897 (J;US)
**Chemical Reactions**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**Chromatography**
Basic science and technology, 9:1928 (RA;US)
**Compton Effect**
Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°, 9:2700 (R;DE;In German)
**Creep**
Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983, 9:2675 (R;US)
**Dimers**
Supersonic copper clusters, 9:3582 (J;US)
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electronic Structure**
Spectroscopic studies of the jet-cooled copper trimer, 9:3541 (J;US)

**Excitation**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Failures**
Mechanisms of damage accumulation in time-dependent cyclic deformation. Progress report, January 1-December 31, 1983, 9:2675 (R;US)
**Ion-Atom Collisions**
Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3507 (R;AU)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Photoelectron Spectroscopy**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Raman Spectra**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Sorptive Properties**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Voltametry**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**X-Ray Spectra**
Extended x-ray absorption fine structure studies of diffused copper impurities in ZnSe, 9:2838 (J;US)

**COPPER 63 TARGET**
**Lithium 6 Reactions**
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)

**COPPER ALLOYS**
*See also COPPER BASE ALLOYS*
**Electronic Structure**
Electronic structure of metallic alloys through Auger and photoemission spectroscopy, 9:2687 (RA;BR)
**Thermal Expansion**
The thermal expansion of the directionally solidified Al-$CuAl_2$ eutectic, 9:2753 (J;NL)

**COPPER BASE ALLOYS**
**Deformation**
Metal surface deformation and subsurface defect structure: a microscopy correlation study, 9:2761 (BA;US)
**Surface Properties**
Metal surface deformation and subsurface defect structure: a microscopy correlation study, 9:2761 (BA;US)

**COPPER CHLORIDES**
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)

**COPPER COMPLEXES**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
**Electrolysis**
Reversible sequential transfer of two electrons at the same potential in bis(1,3,5-triketonato)dicopper(II) complexes and their diamine Schiff bases. Effect of $Na^+$ and similar ions on the cyclic voltammetry, 9:2996 (J;US)
**ENDOR**
ENDOR study of bis(acetylacetonato)copper(II) in solid solution, 9:2956 (J;US)

**COPPER IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)

**COPPER OXIDES**
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
**Decomposition**
Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides, 9:2109 (R;US)
**Oxidation**
Physical mechanisms responsible by the spectral properties of selective surfaces, 9:2775 (RA;BR;In Portuguese)

**COPPER SULFIDES**
**Heterojunctions**
Studies in the CdS/$Cu_2S$ heterojunction, 9:2821 (RA;BR;In Portuguese)
**Photovoltaic Conversion**
Studies in the CdS/$Cu_2S$ heterojunction, 9:2821 (RA;BR;In Portuguese)

**CORE CATCHERS**
**Specifications**
System study on the development of a core catcher concept for light water reactors. Final report/main volume, 9:2429 (R;DE;In German)

**CORE FLOODING SYSTEMS**
**R Codes**
Improvement of core mass balance calculation in REFLA-1D/MODE1, 9:2434 (R;JP)

**CORES (REACTOR)**
*See REACTOR CORES*

**CORN STOVER**
*See AGRICULTURAL WASTES*

**CORONA COUNTERS**
**Sensitivity**
Neutron detection channel with a counter based on the SNM-14 corona counter, 9:3178 (R;SU;In Russian)

**COSMIC GAMMA BURSTS**
**Synchrotron Radiation**
Analysis of the Konus catalog of gamma-ray bursts with the thermal synchrotron model, 9:3477 (J;US)

**COSMIC GAMMA SOURCES**
**Cosmic Gamma Bursts**
Criteria for grasar action in astrophysical sources, 9:3465 (R;US)
**Spectra**
Gamma-gun in the center of the galaxy, 9:3466 (R;SU)

**COSMIC NEUTRINOS**
*Prior to July, 1975 information was indexed to NEUTRINOS.*
**Neutrino Detection**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)

**COSMIC PARTICLES**
*See COSMIC RADIATION*

**COSMIC RADIATION**
*From sources other than the sun; not for SOLAR RADIATION.*
*See also COSMIC NEUTRINOS*
**Energy Spectra**
Origin of low energy antiprotons in cosmic rays, 9:3443 (R;SU)
**Microwave Radiation**
Low-frequency measurement of the spectrum of the cosmic background radiation, 9:3471 (J;US)
**Wave Propagation**
Implications of HEAO-3 data for the acceleration and propagation of galactic cosmic rays, 9:3455 (R;US)

**COSMIC X-RAY SOURCES**
**Cosmic Ray Detection**
Ten years of Vela x-ray observations, 9:3449 (R;US)
**Luminosity**
Electron-positron annihilation and the cosmic X-ray background, 9:3463 (R;US)

**X-Ray Spectra**
Evidence for an ~300 day period in Cygnus X-1, 9:3482 (J;US)

**COSMOGONY**
*See COSMOLOGY*

**COSMOLOGICAL MODELS**
**Electromagnetism**
Arrow of electromagnetic time and the generalized absorber theory, 9:3476 (J;US)
**Entropy**
Cosmological effects of primeval fermion degeneracy in the grand unified theories, 9:3486 (J;US)
**Higgs Model**
Problems with the new inflationary universe, 9:3472 (J;US)
**Lepton Number**
Cosmological effects of primeval fermion degeneracy in the grand unified theories, 9:3486 (J;US)
**Scalar Fields**
Possible mechanism of cosmological term cancellation, 9:3444 (R;SU)
**T Invariance**
Arrow of electromagnetic time and the generalized absorber theory, 9:3476 (J;US)

**COSMOLOGY**
Prospects for further unification, 9:3821 (R;US)
**Background Radiation**
Decay of long-lived particles in the early universe, 9:3485 (J;US)
**Many-Dimensional Calculations**
Entropy from extra dimensions, 9:3473 (J;US)

**COSMOS**
*See UNIVERSE*

**COST**
**Comparative Evaluations**
Economic projections for advanced fuel fabrication, 9:2331 (RA;US)

**COUNTERFLOW COOLING TOWERS**
*See COOLING TOWERS*

**COUNTERS (RADIATION)**
*See RADIATION DETECTORS*

**COUNTING TECHNIQUES**
**Limiting Values**
Detection limit of a signal in a background. Application to radioactivity measurements, 9:3163 (R;FR;In French)

**COUNTY BUILDINGS**
*See PUBLIC BUILDINGS*

**COURT BUILDINGS**
*See PUBLIC BUILDINGS*

**COW-MILKERS**
*See RADIOISOTOPE GENERATORS*

**COYOTES**
**Behavior**
Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis, 9:3280 (J;US)
**Diet**
Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis, 9:3280 (J;US)
**Population Density**
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)
**Predator-Prey Interactions**
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)

**CP INVARIANCE**
CP violation, 9:3813 (RA;US)
**Symmetry Breaking**
Necessity of intermediate mass scales in grand unified theories with spontaneously broken CP invariance, 9:3824 (R;XA)
Tests for complete breakdown of discrete symmetry in D neutral-anti D neutral, 9:3796 (R;XA)

**CRACK GROWTH**
*See CRACK PROPAGATION*

**CRACK PROPAGATION**
**Computerized Simulation**
Computer simulation of crack propagation: lattice trapping, 9:3991 (J;GB)

**CRACKS**
**Electrical Testing**
Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method, 9:3092 (R;JP;In Japanese)

**CRAY COMPUTERS**
**Performance**
Some predictions on the performance of future supercomputers for simulation and control, 9:4248 (R;US)

**CRESOLS**
**Solvent Properties**
Dissolution of coal in solvents, 9:1777 (D;US)

**CRESYLIC ACID**
*See CRESOLS*

**CRISTOBALITE**
**Crystal Structure**
Ab initio calculation of interatomic force constants in $H_8Si_8O_7$ and the bulk modulus of $\alpha$ quartz and $\alpha$ cristobalite, 9:2880 (J;DE)
**Interatomic Forces**
Ab initio calculation of interatomic force constants in $H_8Si_8O_7$ and the bulk modulus of $\alpha$ quartz and $\alpha$ cristobalite, 9:2880 (J;DE)

**CRITICAL ASSEMBLIES**
*See ZERO POWER REACTORS*

**CRITICAL HEAT FLUX**
**Mechanics**
Experimental evidence suppporting two-mechanism critical heat flux, 9:2210 (J;GB)

**CRITICALITY ACCIDENTS**
*See RADIATION ACCIDENTS*

**CROSSFLOW COOLING TOWERS**
*See COOLING TOWERS*

**CRUDE OIL**
*See PETROLEUM*

**CRYOCABLES**
*See CRYOGENIC CABLES*

**CRYOGENIC CABLES**
**Dielectric Properties**
Some characteristics of dielectric materials at cryogenic temperatures for HVDC systems, 9:2193 (J;US)

**CRYSTAL LATTICES**
**Impurities**
Identification and lattice location of low-Z impurities implanted into solids, 9:4172 (RA;JP;In Japanese)
**Transport Theory**
Chaos, periodic chaos, and the random-walk problem, 9:3989 (J;US)
**Traps**
Chaos, periodic chaos, and the random-walk problem, 9:3989 (J;US)

**CRYSTALS**
*See also DENDRITES*
*MONOCRYSTALS*
**Ion Channeling**
Position-dependent stopping power for channeled ions, 9:3967 (J;US)
**Phonons**
Light scattering by surface phonons in crystals, 9:3983 (RA;BR)
**Specific Heat**
Analysis of the phonon surface specific heat using Green function techniques, 9:3980 (RA;BR)
**Spectral Density**
Use of the transfer matrix in the calculation of surface spectral densities, 9:3982 (RA;BR;In Portuguese)
**Surface Properties**
Analysis of the phonon surface specific heat using Green function techniques, 9:3980 (RA;BR)
**Visible Radiation**
Light scattering by surface phonons in crystals, 9:3983 (RA;BR)

**CULTURAL RESOURCES**
Cultural resources overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:1988 (R;US)

**Bibliographies**
Annotated bibliography of cultural resources literature for the Nevada Nuclear Waste Storage Investigations, 9:1989 (R;US)

**CULTURES (CELLS)**
*See CELL CULTURES*

**CURIUM 242**
**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**CURIUM 244**
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)
**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**CURIUM FLUORIDES**
**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**CURIUM OXIDES**
**Curie Point**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Moments**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)
**Magnetic Susceptibility**
Magnetic properties of actinide elements having the $5f^6$ and $5f^7$ electronic configurations, 9:2781 (J;US)

**CURRENT-DRIVE HEATING**
Beat-wave current drive in a magnetized plasma, 9:4048 (R;US)
**Computerized Simulation**
Theory and simulation of RF heating and current drive, 9:4133 (BA;XA)

**CYCLIC ACCELERATORS**
**Beam Dynamics**
Effect of third order discretized resonances (2$\nu$sub(z)-$\nu$sub(x)=1) upon the movement of particles in cyclic accelerators, 9:3136 (RA;HU;In Russian)

**CYCLOALKANES**
*See also ADAMANTANE*
*CONDENSED CYCLOALKANES*
*CYCLOHEXANE*
**Excitation**
High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3005 (J;US)
**Isomerization**
High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3005 (J;US)

**CYCLOALKENES**
**Excitation**
High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3005 (J;US)
**Isomerization**
High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3005 (J;US)

**CYCLOHEXANE**
**Chemisorption**
Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100), 9:2961 (J;US)
**Dehydrogenation**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)

**CYLINDRICAL PARABOLIC COLLECTORS**
*See PARABOLIC TROUGH COLLECTORS*

## D

**D PLUS RESONANCES**
*See D-1865 RESONANCES*

**D RESONANCES**
*See also D-1865 RESONANCES*
**Particle Production**
Inclusive D and D/sup/ production in $e^+e^-$ annihilation at 29 GeV, 9:3714 (J;US)
Production of charmed mesons in $e^+e^-$ annihilation at 10.5 GeV, 9:3712 (J;US)
Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3727 (J;US)
**Semileptonic Decay**
Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons, 9:3747 (R;XA)

**D ZERO RESONANCES**
*See D-1865 RESONANCES*

**D-1865 RESONANCES**
**Configuration Mixing**
Tests for complete breakdown of discrete symmetry in D neutral-anti D neutral, 9:3796 (R;XA)

**DAMS**
**Sedimentation**
Falls Dam, Otago, sedimentation rate measured by the caesium-137 profile, 9:3429 (R;NZ)

**DANISH REACTOR-3**
*See DR-3 REACTOR*

**DARLINGTON-1 REACTOR**
**Engineered Safety Systems**
Separation of safety-related systems at Darlington GS A, 9:2422 (RA;CA)
**Fuel Management**
Simulation of Darlington fuelling with SIMODEX, a fuel management program based on modal expansion method, 9:2258 (RA;CA)
**Neutron Flux**
Simulation of Darlington fuelling with SIMODEX, a fuel management program based on modal expansion method, 9:2258 (RA;CA)
**Reactor Fueling**
Simulation of Darlington fuelling with SIMODEX, a fuel management program based on modal expansion method, 9:2258 (RA;CA)
**Reactor Safety**
Separation of safety-related systems at Darlington GS A, 9:2422 (RA;CA)

**DATA ACQUISITION SYSTEMS**
**Fastbus System**
Status of the IEEE P896 Future Backplane Bus, 9:3193 (R;US)

**DATA BASE MANAGEMENT**
**Computer Codes**
Multidomain, multirecord-type Datatrieve-11 databases, 9:4255 (R;US)
**Information Retrieval**
Multidomain, multirecord-type Datatrieve-11 databases, 9:4255 (R;US)
Processing time using Datatrieve-11, clunks, and FORTRAN, 9:4254 (R;US)
**Statistics**
Research topics in statistical database management, 9:4257 (R;US)

**DATA PROCESSING**
*Manipulation of unit facts.*
**Monte Carlo Method**
New robust method for the treatment of analytical data, 9:3206 (R;ZA)

**DEBRIS (NUCLEAR)**
*See FISSION PRODUCTS*

**DECHANNELING**
*See CHANNELING*

**DECIDUOUS TREES**
*See TREES*

**DECISION MAKING**
Roadmap for complex decisions (Utility problem solving), 9:4238 (J;US)
**DEEP INELASTIC HEAVY ION REACTIONS**
**Inclusive Interactions**
Theoretical aspects of nucleus-nucleus collisions, 9:3938 (RA;XC)
**Multiple Production**
Theoretical aspects of nucleus-nucleus collisions, 9:3938 (RA;XC)
**DEEP INELASTIC SCATTERING**
**Differential Cross Sections**
Deep inelastic lepton-nuclear interactions, 9:3943 (RA;SU;In Russian)
**Feynman Path Integral**
Path integral theory and deep inelastic scattering of nuclei, 9:3957 (B;GB)
**Parton Model**
Problem of the deuteron smearing corrections - 1: the conventional approach, 9:3744 (R;XA)
**DEFORMED NUCLEI**
**Vibrational States**
Vibrational states of deformed odd nuclei, 9:3917 (R;SU;In Russian)
**DELAYED NEUTRONS**
**Neutron Spectra**
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3899 (R;US)
**DELTA RESONANCES (MESON)**
*See MESON RESONANCES*
**DEMOCRITUS REACTOR**
**Fuel Elements**
Comparison of some measurements in the Greek Research Reactor-1 (GRR-1) with 20% and 93% enriched uranium fuel elements, 9:2374 (RA;US)
**DEMONSTRATION PROGRAMS**
**Evaluation**
Measuring effects of utility conservation programs: inputs to utility decision making, 9:2588 (R;US)
**DENDRITES**
**Solidification**
Geometrical approach to moving-interface dynamics, 9:4022 (J;US)
**DENDRITIC WEB GROWTH METHOD**
Apparatus for growing a dendritic web, 9:2861 (P;US)
**DENITRIFICATION**
**Catalysts**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Research Programs**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**DENMARK**
**Geological Surveys**
Seismic mapping and geological prognosis for the geothermal prospects Farsoe, Nibe and Loegstoer: exploratory well and reservoir investigation Farsoe-1. Parts 1, 2, and 3, 9:2156 (R;US)
**Regulations**
Order No. 571 of 7 December 1981 on apparatus used for X-ray analysis, 9:4262 (R;DK;In Danish)
**Seismic Surveys**
Seismic mapping and geological prognosis for the geothermal prospects Farsoe, Nibe and Loegstoer: exploratory well and reservoir investigation Farsoe-1. Parts 1, 2, and 3, 9:2156 (R;US)
**DENSITOMETERS**
**Data Analysis**
Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3190 (R;AT;In German)
**Radiometric Gages**
Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3190 (R;AT;In German)
**DENSITY (ENERGY-LEVEL)**
*See ENERGY-LEVEL DENSITY*
**DENSITY (PLASMA)**
*See PLASMA DENSITY*
**DEOXYCYTIDINURIA**
*See URINE*
**DEOXYPENTOSE NUCLEIC ACID**
*See DNA*
**DEOXYRIBONUCLEIC ACID**
*See DNA*
**DEPARTMENT OF DEFENSE**
*See US DOD*
**DEPLETED URANIUM**
**Neutron Transport**
Investigation of neutron kinetics in the nanosecond range in a depleted uranium sphere, 9:3960 (R;SU;In Russian)
**DEPLETION (ISOTOPIC)**
*See ISOTOPE SEPARATION*
**DESOXYRIBONUCLEIC ACID**
*See DNA*
**DESULFURIZATION**
**Catalysts**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Cost Benefit Analysis**
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1798 (R;US)
**Research Programs**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**DETECTION (FAILED ELEMENT)**
*See FAILED ELEMENT DETECTION*
**DETECTORS (RADIATION)**
*See RADIATION DETECTORS*
**DETONATIONS**
**Measuring Methods**
Optical diagnostics for condensed-phase shock-compressed molecular systems, 9:3223 (R;US)
**DEUTERIUM**
**Chemical Analysis**
Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2888 (R;NZ)
**Chemical Reaction Kinetics**
Kinetics of the Cl—$H_2$ system. II. Abstraction vs exchange in D+HCl, 9:2949 (J;US)
Reduced dimensionality quantum rate constants for the D+$H_2$(v = 0) and D+$H_2$(v = 1) reactions on the LSTH surface, 9:2916 (J;US)
**Dissolution**
Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3394 (J;GB)
**Inhalation**
Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3394 (J;GB)
**Ion-Atom Collisions**
Isotope effect in electron-capture differential cross sections at intermediate energies, 9:3593 (J;US)
**Isotope Effects**
Centrifugal distortion and internal rotation analysis of the microwave spectrum of ethyl fluoride, 9:3573 (J;US)
Infrared photochemistry of specifically deuterated bicyclopropyl. A direct test of statistical unimolecular rate theory applied to branching ratios in multiphoton dissociation, 9:3013 (J;US)
Lifetimes of the ligand-to-metal charge-transfer excited states of iron(III) and osmium(III) polypyridine complexes. Effects of isotopic substitution and temperature, 9:2919 (J;US)
Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2971 (R;US)
Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+\ ^{35}Cl$, 9:2943 (J;US)
**Isotope Ratio**
Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2888 (R;NZ)
**Isotope Separation**
Isotope enrichment during the formation of water clusters in supersonic free jet expansions, 9:2952 (J;US)
**Isotopic Exchange**
Feed cycles for the industrial production of heavy water through multiphoton dissociation of fluoroform, 9:2063 (J;US)

Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1766 (R;US)
**Nuclear Magnetic Resonance**
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystalline sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)

**DEUTERIUM IONS**
**Beam Neutralization**
Photodetachment neutralizer development - laser-resonator study. Volume 1. Summary. Final report, 9:3076 (R;US)
Photodetachment neutralizer development - laser-resonator study. Volume II. Appendix. Final report, 9:3077 (R;US)
**Charge Exchange**
Production of negative $D^-$ ions by double charge exchange using cesium, 9:4225 (TG;US)
**Collisions**
Empirical formulas for the reflection of light ions from solids, 9:4168 (RA;JP)
Reflection of low energy light-element ions from solid surfaces, 9:4169 (RA;JP;In Japanese)
**Ion Emission**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)
**Ion-Atom Collisions**
Electron detachment for $H^-$ ($D^-$) in collisions with Ne, 9:3549 (J;US)
**Trapping**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)

**DEUTERIUM OXIDES**
*See HEAVY WATER*

**DEUTERIUM TARGET**
**Alpha Reactions**
Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3862 (R;SU)
Study of the particle unstable S-nucleus resonances $^5$Lisup(3/2-) and $^5$Hesup(3/2-) in the reaction α+d->α+p+n at the c.m. energy Esub(CMS)=9.3 MeV, 9:3860 (R;DE;In German)
**Helium 3 Reactions**
Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3862 (R;SU)
**Neutron Reactions**
Weak nucleon-nucleon interaction in few body systems, 9:3861 (R;FR)
**Photonuclear Reactions**
Deuteron forward photodisintegration: meson currents and relativity, 9:3866 (R;US)
**Pion Reactions**
Study of pion-nucleus reactions with high-energy pion beams, 9:3863 (RA;US)
**Proton Reactions**
Configuration space Faddeev continuum calculations: p-d s-wave scattering length, 9:3868 (J;US)
Effects of the $^3$He D state in the reaction $^2$H(p,γ)$^3$He, 9:3867 (J;US)

**DEUTERON BEAMS**
**Beam Production**
Single-ring magnetic cusp ion source, 9:3551 (J;US)
**Electron Density**
Single-ring magnetic cusp ion source, 9:3551 (J;US)
**Energy Spectra**
Single-ring magnetic cusp ion source, 9:3551 (J;US)

**DEUTERON REACTIONS**
**Cross Sections**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Polarization**
Fusion reactor plasmas with polarized nuclei, 9:4128 (BA;XA)

**DEUTERON-DEUTERON INTERACTIONS**
*See DEUTERIUM TARGET*
*DEUTERON REACTIONS*

**DEUTERONS**
**D Waves**
Deuteron D-wave and the non-eikonal effects in tensor asymmetries in elastic proton-deuteron scattering, 9:3740 (R;XA)
**Form Factors**
Quantum chromodynamics in few-nucleon systems, 9:3773 (R;US)
**Ion-Atom Collisions**
Isotope effect in electron-capture differential cross sections at intermediate energies, 9:3593 (J;US)

**DEVICES**
*See EQUIPMENT*

**DEVONIAN SHALES**
*See BLACK SHALES*

**DIAMONDS**
**Fine Structure**
Fine structure in the orientational dependence of the total yield of superfast electrons from a diamond crystal, 9:2816 (R;SU;In Russian)

**DIAPHRAGMS (THERMONUCLEAR DEVICE)**
*See LIMITERS*

**1,4-DIAZINES**
*See PYRAZINES*

**DIAZO COMPOUNDS**
**Chemical Reactions**
Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2920 (J;US)
**Structural Chemical Analysis**
Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2920 (J;US)

**DIBARYON RESONANCES**
**Mass**
Spectroscopy of strange dibaryons with $K^-d \rightarrow Ap\pi^-$ reaction, 9:3660 (RA;US)
**Quantum Numbers**
Spectroscopy of strange dibaryons with $K^-d \rightarrow Ap\pi^-$ reaction, 9:3660 (RA;US)

**DIBENZOPYRROLES**
*See CARBAZOLES*

**DIDO REACTOR**
**Fuel Elements**
Note on current position regarding the development by the UKAEA of reduced enrichment fuels for research and test reactors, 9:2359 (RA;US)

**DIELECTRIC TRACK DETECTORS**
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)
**Mathematical Models**
Collective aspects of charged particle track structure in non-metallic solids, 9:3164 (R;US)
**Neutron Dosimetry**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
**Performance**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)

**DIENES**
**Chemical Reaction Yield**
High vibrational overtone photochemistry of 1-cyclopropylcyclobutene, 9:3005 (J;US)
**Isomerization**
Variations in mechanism for photoinduced valence isomerizaation of an electron-donor nonconjugated diene, 9:3018 (J;US)

**DIESEL ENGINES**
**Compression**
Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine, 9:3117 (R;US)
**Computerized Simulation**
Numerical experiments with CONCHAS-SPRAY: compression stroke of an external-chamber diesel engine, 9:3117 (R;US)
**Exhaust Gases**
Literature survey of the composition and of the acute effects of the exhaust gases of Diesel engines, 9:3261 (R;SE;In Swedish)

**Failures**
Common cause failure rate estimates for diesel generators in nuclear power plants, 9:2499 (BA;US)
**Fuel Injection Systems**
Methanol-dual fuel operation of diesel engines with direct injection, 9:2663 (R;DE;In German)
**Fuel Substitution**
Methanol-dual fuel operation of diesel engines with direct injection, 9:2663 (R;DE;In German)
**Methanol Fuels**
Methanol-dual fuel operation of diesel engines with direct injection, 9:2663 (R;DE;In German)
**Optimization**
Cummins advanced turbocompound diesel engine evaluation, 9:2662 (R;US)
**Risk Assessment**
Common cause failure rate estimates for diesel generators in nuclear power plants, 9:2499 (BA;US)

**DIET**
**Seasonal Variations**
Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3315 (RA;US)

**DIETHYLENETRIAMINEPENTAACETIC ACID**
*See DTPA*

**DIFFUSE SOLAR RADIATION**
**Solar Flux**
Circumsolar sky radiation: the flux density of radiation energy originating from the circumsolar sky measured at groundbased stations. Final report, 9:2095 (R;XE)

**DIGITAL FILTERS**
**Design**
Edge and line enhancement by adaptive lattice filtering, 9:3220 (J;US)

**DIGOXIN**
**Radioimmunoassay**
Interference factors in digoxin analysis, especially in the serum of pregnant women, by RIA. Clinical aspects, methods, comparative studies using different RIA techniques, 9:3353 (R;DE;In German)

**DIMERIZATION**
**Configuration Interaction**
Electron-electron interactions and broken symmetry in one dimension, 9:3535 (R;US)

**2,2-DIMETHYLPROPANE**
*See 2-2-DIMETHYLPROPANE*

**2-2-DIMETHYLPROPANE**
**Pyrolysis**
Formation of hydrogen atoms in pyrolysis of 2,2-dimethylpropane behind shock waves, 9:2978 (J;US)

**DIODE TRANSISTORS**
*See TRANSISTORS*

**DIRAC EQUATION**
**Bound State**
Comment on "quark confinement and the Dirac equation", 9:3841 (J;US)

**DIRAC MONOPOLES**
*See MAGNETIC MONOPOLES*

**DIRICHLET PROBLEM**
Characterization of the Dirichlet distribution as prior, 9:4241 (R;XE)

**DISCHARGES (IONIZATION)**
*See IONIZATION*

**DISCHARGES (WASTES)**
*See WASTE DISPOSAL*

**DISCHARGING (REACTOR)**
*See REACTOR FUELING*

**DISINTEGRATION (FISSION)**
*See FISSION*

**DISPERSANTS (CHEMICAL)**
*See SURFACTANTS*

**DISPOSAL (WASTES)**
*See WASTE DISPOSAL*

**DISSOLVED OXYGEN**
*See OXYGEN*

**DISTILLATE FUEL**
*See HEATING OILS*

**DISTILLATE FUEL OIL**
*See HEATING OILS*

**DISTILLATION EQUIPMENT**
**Corrosion**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)

**DISTRIBUTION FUNCTIONS**
**Series Expansion**
Properties of estimators for the gamma distribution, 9:4252 (J;US)

**DISTRICT HEATING**
*See also GEOTHERMAL DISTRICT HEATING*
Proceedings of the forum on district heating for Long Island, 9:2654 (R;US)
**Boiler Fuels**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2556 (R;FI;In Finnish)
**Comparative Evaluations**
Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2657 (R;SE;In Swedish)
**Economic Analysis**
Heat storage in district heating systems, 9:2658 (R;FI;In Finnish)
**Heat Storage**
Heat storage in district heating systems, 9:2658 (R;FI;In Finnish)
**Waste Heat Utilization**
Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2657 (R;SE;In Swedish)

**DIVERTORS**
*See also POLOIDAL DIVERTORS*
**Mathematical Models**
Predicted behaviour of the single-null divertor of INTOR, 9:4142 (R;GB)
**Plasma Sheath**
Applications of hybrid numerical-simulation methods to magnetic-confinement systems, 9:4046 (R;US)

**DNA**
**Biological Repair**
Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983, 9:3386 (R;US)
**Electrophoresis**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3344 (R;US)

**DORMITORIES**
*See RESIDENTIAL BUILDINGS*

**DOUBLET 3 DEVICES**
*See DOUBLET REACTORS*

**DOUBLET REACTORS**
**Surface Cleaning**
Initial wall conditioning in Doublet III, 9:4196 (J;US)
**Walls**
Initial wall conditioning in Doublet III, 9:4196 (J;US)

**DOUGLAS POINT ONTARIO REACTOR**
*For information indexed before 1976 CANDU REACTOR was used.*
**Repair**
Example of remote maintenance in high radiation fields, 9:2266 (RA;CA)
Remotely controlled repairs at Douglas Point NGS, 9:2265 (RA;CA)

**DOUGLAS POINT POWER STATION**
*See DOUGLAS POINT ONTARIO REACTOR*

**DOUNREAY PROTOTYPE FAST REACTOR**
*See PFR REACTOR*

**DOW PUSHER 700**
*See POLYAMIDES*

**DR-3 REACTOR**
**Fuel Elements**
Reduced enrichment activities in Denmark, 9:2358 (RA;US)

**DRIFT CHAMBERS**
**Performance Testing**
Study of the operation of migration chambers for detection with the SPES III spectrometer, 9:3165 (R;FR;In French)

**Power Supplies**
Stabilized high voltage power supply of proportional and drift chambers, 9:3177 (R;SU;In Russian)

**DRILL PIPES**
**Threaded Joints**
Tool joint design and operating torque, 9:3065 (R;US)
**Torque**
Tool joint design and operating torque, 9:3065 (R;US)

**DRILL SHIPS**
*See OFFSHORE PLATFORMS*
*SHIPS*

**DRILLING PLATFORMS**
*See OFFSHORE PLATFORMS*

**DRY-TYPE COOLING TOWERS**
*See COOLING TOWERS*

**D-T REACTORS**
**Breeding Blankets**
Summary of HEDL Fusion Reactor Safety Support studies, 9:4160 (RA;XA)
**Environmental Impacts**
Safety considerations in fusion reactor design, 9:4218 (BA;XA)
**Reactor Accidents**
Safety considerations in fusion reactor design, 9:4218 (BA;XA)
**Reactor Safety**
Summary of HEDL Fusion Reactor Safety Support studies, 9:4160 (RA;XA)

**DTO**
*See HEAVY WATER*
*TRITIUM COMPOUNDS*

**DTPA**
**Radiosensitivity Effects**
The effect of x rays, DTPA, and aspirin on the absorption of plutonium from the gastrointestinal tract of rats, 9:3396 (J;US)

**DUALITY**
**Transformations**
Surface terms and dual formulations of gauge theories, 9:3826 (R;XA)

**DUAL-PURPOSE POWER PLANTS**
**Boiler Fuels**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2556 (R;FI;In Finnish)
**Design**
Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant, 9:4203 (BA;XA)
**Electrolysis**
Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant, 9:4203 (BA;XA)

**DUCKS**
**Contamination**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
**Environmental Exposure Pathway**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
Residence time, dispersal, and harvest of waterfowl using a radioactive leaching pond in southeastern Idaho, 9:3332 (RA;US)
**Food Processing**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)

**DUCTS**
**Radiation Transport**
Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct, 9:3963 (R;JP)

**DUSTS**
**Control**
Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82, 9:1802 (R;US)
**Precipitation**
Theoretical and experimental investigations on dust separation in assemblies of perforated metal sheets, 9:3105 (R;DE;In German)

**DYES**
*See also PHTHALOCYANINES*
**Absorption Spectra**
Efficient nonphotochemical hole burning of dye molecules in polymers, 9:2977 (J;US)
**Photochemical Reactions**
Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983, 9:3000 (R;US)

**DYMAC SYSTEM**
*See NUCLEAR MATERIALS MANAGEMENT*
*PLUTONIUM*

**DYNAMIC MATERIALS ACCOUNTABILITY SYSTEM**
*See NUCLEAR MATERIALS MANAGEMENT*
*PLUTONIUM*

**DYNAMICS**
**Nonlinear Problems**
Geometrical approach to moving-interface dynamics, 9:4022 (J;US)

**DYONS**
*Hypothetical particles endowed with both electric and magnetic charges.*
**Charge Distribution**
Global quantity for dyons with various charge distributions, 9:3746 (R;XA)
**Electric Charges**
Time delay and the dyon charge, 9:3780 (J;US)
Witten's charge formula, 9:3793 (R;XA)

**DYSPROSIUM 148**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)

**DYSPROSIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)

**DYSPROSIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)

## E

**E-1422 RESONANCES**
**Gluon Model**
Hadron phenomenology, 9:3755 (R;BR;In Portuguese)
**Quantum Flavordynamics**
Hadron phenomenology, 9:3755 (R;BR;In Portuguese)

**EARTH CRUST**
**Electromagnetic Surveys**
Properties of the ground inferred from electromagnetic measurements, 9:3433 (J;US)
**Geochemistry**
Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1870 (R;US)

**EARTH-COVERED BUILDINGS**
**Civil Defense**
Hazard-mitigation potential of earth-sheltered residences. Final report, 1982-1983, 9:4271 (R;US)
**Reviews**
Hazard-mitigation potential of earth-sheltered residences. Final report, 1982-1983, 9:4271 (R;US)

**EARTHQUAKES**
**Ground Motion**
Effects of site characteristics on near-source recordings of strong ground motion, 9:3432 (R;US)
**Seismic Effects**
Effects of site characteristics on near-source recordings of strong ground motion, 9:3432 (R;US)

**EAST MESA GEOTHERMAL FIELD**
**Resource Development**
Imperial County geothermal development annual meeting: summary, 9:2150 (R;US)

**EBIC**
*See SCANNING ELECTRON MICROSCOPY*
**ECONOMETRICS**
**Computer Codes**
Econometric estimates of the EDM model (Italian version of Frankfurt and Cambridge model), 9:2549 (R;XE)
**ECONOMIC DEVELOPMENT**
**Program Management**
Energy and economic development: a practical guide for the 1980's, 9:2589 (R;US)
**ECONOMIC POLICY**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**ECR HEATING**
Mode conversion and local heating below the second electron cyclotron harmonic, 9:4060 (R;JP)
**Computerized Simulation**
Theory and simulation of RF heating and current drive, 9:4133 (BA;XA)
**EDTA**
**Photochemical Reactions**
Formation of photoactive charge-transfer complexes between methylviologen and sacrificial electron donors. EDTA and triethanolamine, 9:3004 (J;US)
**EFFLUENTS (CHEMICAL)**
*See CHEMICAL EFFLUENTS*
**EFFLUENTS (GASEOUS)**
*See GASEOUS WASTES*
**EFFLUENTS (RADIOACTIVE)**
*See RADIOACTIVE EFFLUENTS*
**EFFLUENTS (THERMAL)**
*See THERMAL EFFLUENTS*
**EFR REACTOR**
*See JOYO REACTOR*
**EHF RADIATION**
*See MICROWAVE RADIATION*
**EIGENVALUES**
**Semiclassical Approximation**
Semiclassical quantization and extraction of eigenfunctions using arbitrary trajectories, 9:4026 (J;US)
**EINSTEIN FIELD EQUATIONS**
**Metrics**
Bianchi-symmetric metrics, 9:3845 (J;US)
**EINSTEIN-DE SITTER MODEL**
*See COSMOLOGICAL MODELS*
**EINSTEINIUM 254**
**Isotope Production**
Transuranium-element processing, 9:3037 (RA;US)
**ELASTIC PROPERTIES**
*See ELASTICITY*
**ELASTICITY**
**Measuring Methods**
Digitally controlled measurement of sonic elastic moduli and internal friction by phase analysis, 9:3213 (J;US)
**ELASTOMERS**
*See also RUBBERS*
**Mathematical Models**
Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers, 9:2801 (R;US)
**Reinforced Materials**
Linear and nonlinear viscoelastic constitutive relations of cord reinforced elastomers, 9:2801 (R;US)
**ELECTRETS**
**Piezoelectricity**
Mechanism of piezo - and pyroelectricity of poly (vinylidene fluoride) electret, 9:3984 (RA;BR)
**Polarization**
Mechanism of piezo - and pyroelectricity of poly (vinylidene fluoride) electret, 9:3984 (RA;BR)
**ELECTRIC APPLIANCES**
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report, 9:2618 (R;US)
**Field Tests**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
**ELECTRIC BATTERIES**
*Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.*
*See also LEAD-ACID BATTERIES*
*METAL-GAS BATTERIES*
**Cost Estimation**
Study to establish cost projections for production of redox chemicals, 9:2519 (R;US)
**Reagents**
Study to establish cost projections for production of redox chemicals, 9:2519 (R;US)
**ELECTRIC BRIDGES**
**Hot Spots**
Two-dimensional imaging of hotspots in superconducting bridges by low-temperature scanning electron microscopy, 9:3068 (J;US)
**ELECTRIC CABLES**
*See also CRYOGENIC CABLES*
**Seals**
Fabrication of a hermetically sealed connector, 9:3098 (R;US)
**ELECTRIC CONDENSERS**
*See CAPACITORS*
**ELECTRIC CONTACTS**
**Screen Printing**
Development of metallization process: FSA Project, cell, and module-formation research area. Quarterly technical progress report No. 6329-15 for the period ending June 30, 1983, 9:2102 (R;US)
**ELECTRIC FILTERS**
**Computerized Simulation**
Second-order adaptive infinite impulse response filter, 9:3100 (R;US)
**ELECTRIC MOTORS**
**Control Systems**
Control system for a wound-rotor motor, 9:2192 (P;US)
**Stresses**
Design criteria for rotating machinery to withstand fast electric bus transfer, 9:2328 (RA;CA)
**ELECTRIC POWER**
**Control Equipment**
Digital substation control systems in the electricity supply. System description, 9:2191 (R;NO;In Norwegian)
**Cost**
Peat-fired electric power plants (Sweden), 9:1810 (R;SE;In Swedish)
**Microprocessors**
Digital substation control systems in the electricity supply. System description, 9:2191 (R;NO;In Norwegian)
**Prices**
Lengthy case processing causes overlapping of electric rate increases, 9:2566 (R;US)
**ELECTRIC POWER SYSTEMS**
*See POWER SYSTEMS*
**ELECTRIC UTILITIES**
**Condenser Cooling Systems**
Helium approach to leak detection, 9:2189 (J;US)
**Cooperatives**
Legislation needed to improve administration of tax exemption provisions for electric cooperatives, 9:2527 (R;US)
**Pollution Control Equipment**
Particulates: caught at the filter line, 9:2190 (J;US)
**Rate Structure**
Applicability of ratemaking and lifeline-rate standards of PURPA, 9:2565 (R;US)
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
Lengthy case processing causes overlapping of electric rate increases, 9:2566 (R;US)
**Simulation**
Using simulation for policy evaluation in the electric utility industry, 9:2569 (J;US)

**ELECTRICAL EQUIPMENT**
*See also ANTENNAS*
*CAPACITORS*
*ELECTRIC BRIDGES*
*ELECTRIC CONTACTS*
*ELECTRICAL INSULATORS*
**Damage**
Relationship of fire protection research to plant safety (PWR; BWR), 9:2452 (R;US)
**Fire Prevention**
Relationship of fire protection research to plant safety (PWR; BWR), 9:2452 (R;US)
**ELECTRICAL INSULATORS**
**Spin Waves**
Surface nuclear spin waves in a semi-infinite ferromagnetic insulator, 9:3520 (RA;BR)
**ELECTROCHEMICAL CELLS**
*See also ELECTRIC BATTERIES*
*PHOTOELECTROCHEMICAL CELLS*
**Solid Electrolytes**
Impurities and solid electrolyte failure, 9:2526 (J;NL)
**ELECTRODES**
**Catalysts**
Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983, 9:2523 (R;US)
**ELECTROLYTES**
*See also SOLID ELECTROLYTES*
**Thermodynamic Activity**
Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes, 9:2968 (J;US)
**ELECTROMAGNETIC FIELDS**
**Biological Effects**
Elf (extremely low frequency) communications system ecological monitoring program. The effects of exposing the slime mold Physarum polycephalum to electromagnetic fields, 9:3425 (R;US)
**ELECTROMAGNETIC INTERACTIONS**
*See also COMPTON EFFECT*
Electroweak interactions, 9:3673 (RA;US)
**ELECTROMAGNETIC RADIATION**
*See also BREMSSTRAHLUNG*
*GAMMA RADIATION*
*INFRARED RADIATION*
*LASER RADIATION*
*MICROWAVE RADIATION*
*VISIBLE RADIATION*
*X RADIATION*
**Decay Instability**
Decay of an electromagnetic wave into an ion-acoustic wave and a Langmuir mode which is heavily damped, 9:4077 (R;GB)
**Parametric Instabilities**
Decay of an electromagnetic wave into an ion-acoustic wave and a Langmuir mode which is heavily damped, 9:4077 (R;GB)
**ELECTROMAGNETIC SURVEYS**
**Reviews**
Properties of the ground inferred from electromagnetic measurements, 9:3433 (J;US)
**Uses**
Properties of the ground inferred from electromagnetic measurements, 9:3433 (J;US)
**ELECTROMAGNETIC TRANSITIONS**
*See ENERGY-LEVEL TRANSITIONS*
**ELECTROMAGNETIC WAVES**
*See ELECTROMAGNETIC RADIATION*
**ELECTROMAGNETISM**
**T Invariance**
Arrow of electromagnetic time and the generalized absorber theory, 9:3476 (J;US)
**ELECTRON ACCEPTOR**
*See ELECTRONS*
*VALENCE*
**ELECTRON BEAM INDUCED CURRENT**
*See SCANNING ELECTRON MICROSCOPY*
**ELECTRON BEAM INJECTION**
**Ionization**
Computer code realization for a mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber, 9:3530 (R;SU;In Russian)
**ELECTRON BEAM TARGETS**
**Charged-Particle Transport**
Enhancement of energy deposition of intense electron beam on low Z targets, 9:4177 (RA;JP)
**ELECTRON BEAMS**
**Beam Optics**
Electron-beam guiding and phase-mix damping by an electrostatically charged wire, 9:3138 (J;US)
**Depolarization**
Simulation of electron spin depolarisation with the computer code SITROS, 9:3131 (R;DE)
**Radiation Dose Distributions**
Electron therapy of breast carcinoma. Pt. 1. Treatment planning, 9:3367 (RA;HU;In Hungarian, English)
**ELECTRON COLLISIONS**
*See also ELECTRON-ATOM COLLISIONS*
*ELECTRON-MOLECULE COLLISIONS*
**Bremsstrahlung**
Shape functions for atomic-field bremsstrahlung from electrons of kinetic energy 1—500 keV on selected neutral atoms $1 <$ or $= Z <$ or $= 92$, 9:3566 (J;US)
**ELECTRON CYCLOTRON-RESONANCE HEATING**
*See ECR HEATING*
**ELECTRON DONOR**
*See ELECTRONS*
*VALENCE*
**ELECTRON MICROSCOPY**
*See also SCANNING ELECTRON MICROSCOPY*
*TRANSMISSION ELECTRON MICROSCOPY*
**Physical Radiation Effects**
The role of environmental conditions in in-situ experiments in the high-voltage electron microscope, 9:3219 (J;DD)
**ELECTRON NEUTRINOS**
**Oscillations**
Search for neutrino oscillations: present experimental data and future experiments, 9:3625 (RA;SU)
**ELECTRON PARAMAGNETIC RESONANCE**
*See ELECTRON SPIN RESONANCE*
**ELECTRON REACTIONS**
**Inelastic Scattering**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**Particle Structure**
Prospects in the study of very inelastic electronuclear reactions, 9:3731 (R;FR)
**ELECTRON RINGS**
**Larmor Radius**
Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability, 9:4107 (J;US)
**Stability**
Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability, 9:4107 (J;US)
**ELECTRON SOURCES**
Intense relativistic electron beam injector system for tokamak current drive, 9:4198 (J;US)
**ELECTRON SPECTROSCOPY**
*See also PHOTOELECTRON SPECTROSCOPY*
**Spectral Shift**
Mathematical adjusts to ESCA spectra, 9:3525 (RA;BR;In Spanish)
**ELECTRON SPIN RESONANCE**
**Uses**
Direct observation of radical-pair interaction and decay in anionic micelles. A time-resolved electron-spin-echo study, 9:3014 (J;US)
**ELECTRON-ATOM COLLISIONS**
**Ionization**
Theoretical triply differential cross section of electron-impact ionization of atoms, 9:3564 (J;US)
**ELECTRONIC DATA PROCESSING**
*See DATA PROCESSING*

**ELECTRON-MOLECULE COLLISIONS**
**Elastic Scattering**
Cross sections for electron impact excitation of electronic states in $UF_6$ at incident electron energies of 10, 20, and 40 eV, 9:3543 (J;US)
**Inelastic Scattering**
Cross sections for electron impact excitation of electronic states in $UF_6$ at incident electron energies of 10, 20, and 40 eV, 9:3543 (J;US)
**ELECTRON-NUCLEON INTERACTIONS**
*See also ELECTRON-PROTON INTERACTIONS*
**P Invariance**
P-odd nuclear forces are a source of parity violation in atom, 9:3812 (RA;SU;In Russian)
**ELECTRON-POSITRON INTERACTIONS**
**Annihilation**
Evidence for the F meson at 1970 MeV, 9:3730 (J;US)
Gluon fragmentation in T(1S) decays, 9:3620 (R;DE)
Inclusive D and D/sup/ production in $e^+e^-$ annihilation at 29 GeV, 9:3714 (J;US)
Production of charmed mesons in $e^+e^-$ annihilation at 10.5 GeV, 9:3712 (J;US)
Quark flavor identification in electron-positron annihilation, 9:3707 (R;US)
Recent results from Jade on electroweak interactions, 9:3621 (R;DE)
**Bhabha Scattering**
Recent results from Jade on electroweak interactions, 9:3621 (R;DE)
**Inclusive Interactions**
Inclusive production of electrons and muons in multihadronic events at PETRA, 9:3619 (R;DE)
Observation of baryons in B-meson decay, 9:3713 (J;US)
**Jet Model**
Quark flavor identification in electron-positron annihilation, 9:3707 (R;US)
Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3708 (R;US)
**Pair Production**
Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3708 (R;US)
**Particle Production**
Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3708 (R;US)
**Radiative Corrections**
Radiative corrections to $e^+e^-$ reactions to all orders in $\alpha$ using the renormalization group, 9:3708 (R;US)
**Total Cross Sections**
Electron-positron annihilation cross section in SU(2)/sub L/xU(1) supergravity, 9:3716 (J;US)
**Unified Gauge Models**
Electron-positron annihilation cross section in SU(2)/sub L/xU(1) supergravity, 9:3716 (J;US)
**ELECTRON-PROTON INTERACTIONS**
**Deep Inelastic Scattering**
New measurement of deep-inelastic e-p asymmetries, 9:3711 (J;US)
**ELECTRON-RING ACCELERATORS**
**Beam Emittance**
Electron beam formation in the injection point in the adgezator of the electron-ring accelerator prototype, 9:3132 (R;SU;In Russian)
**Magnetic Fields**
Magnetic field formation at the electron ring extraction from the collective accelerator model, 9:3135 (R;SU;In Russian)
Specificities of magnetic field formation in the adgezator of a collective accelerator model, 9:3134 (R;SU;In Russian)
**ELECTRONS**
*See also SOLVATED ELECTRONS*
**Absorption**
Absorption of spin-dependent electrons in metals, 9:2697 (RA;BR;In Spanish)
**Collisions**
Desorption by ions and electrons, 9:4170 (RA;JP;In Japanese)
**Dose Equivalents**
Dose-rate conversion factors for external exposure to photons and electrons, 9:3392 (J;GB)
**Energy Losses**
Phenomenon of the minimum of radiation energy losses of relativistic electrons in the crystal, 9:3959 (R;SU;In Russian)
**Gyromagnetic Ratio**
Present state of quantum electrodynamics, 9:3830 (RA;SU;In Russian)
**Polarimeters**
Absorption of spin-dependent electrons in metals, 9:2697 (RA;BR;In Spanish)
**ELECTROREFINING**
**Electrolytic Cells**
Electrolyzer for obtaining and refining metals, 9:2711 (TG;US)
**ELECTROSTATIC WAVES**
*See PLASMA WAVES*
**ELMO BUMPY TORUS**
**Design**
ELMO Bumpy Torus fusion reactor design study, 9:4204 (BA;XA)
**Flute Instability**
Role of the hot-electron distribution function in the stability of the ELMO Bumpy Torus, 9:4108 (J;US)
**High-Frequency Heating**
Plasma properties and ion heating in EBT-S and hot electron rings at TRW, 9:4130 (BA;XA)
**ICR Heating**
Theory of transport and heating in EBT, 9:4135 (BA;XA)
**Microwave Radiation**
Measurements of the microwave power in the wall at EBT-I/S, 9:4039 (R;US)
**Plasma Diagnostics**
Scanning microwave interferometer for ELMO bumpy torus, 9:4098 (J;US)
**Plasma Instability**
Observation of hot-electron ring instabilities in ELMO Bumpy Torus, 9:4076 (R;US)
**Transport Theory**
Oak Ridge National Laboratory ELMO Bumpy Torus radially resolved, time-dependent, one-dimensional transport code - user's guide, 9:4075 (R;US)
WHISTBT: a 1-1/2-D radial-transport code for bumpy tori, 9:4074 (R;US)
**EMERGENCY PLANS**
**Audits**
Analysis of the comprehensive energy emergency response procedures report, 9:2533 (R;US)
**EMITTANCE (BEAM)**
*See BEAM EMITTANCE*
**EMPLOYEES**
*See PERSONNEL*
**EMPLOYMENT**
**Affirmative Action**
Affirmative Action Plan, October 1983 through September 1984, 9:2535 (R;US)
**END USE SECTOR**
*See COMMERCIAL SECTOR*
*INDUSTRY*
*RESIDENTIAL SECTOR*
*TRANSPORTATION SECTOR*
**ENDANGERED SPECIES**
**Inventories**
Survey and assessment of the rare vascular plants of the Idaho National Engineering Laboratory, 9:3301 (RA;US)
**Regulatory Guides**
Environmental compliance guide: guidance manual for Department of Energy compliance with the Endangered Species Act, 9:3320 (R;US)
**ENDF**
*See NUCLEAR DATA COLLECTIONS*
**ENDOMETRIUM**
*See UTERUS*
**ENDOSTEUM**
*See BONE TISSUES*
**ENERGY**
*See also NUCLEAR ENERGY*
*SOLAR ENERGY*

**Bibliographies**
Energy. A continuing bibliography with indexes, issue 36, January 1983, 9:4256 (R;US)
**ENERGY CONSERVATION**
Municipal Energy Conservation Project. Final report, 9:2660 (R;US)
**Demonstration Programs**
Measuring effects of utility conservation programs: inputs to utility decision making, 9:2588 (R;US)
Residential conservation demonstration program. Final report, 9:2616 (R;US)
**Evaluation**
Energy conservation policies, 9:2536 (BA;US)
**Government Policies**
After energy price decontrol: The role of government conservation programs, 9:2557 (R;US)
**Marketing Research**
New York State Energy Office fuel-Oil Conservation Marketing Program. Final report, 9:2604 (R;US)
**Program Management**
Energy and economic development: a practical guide for the 1980's, 9:2589 (R;US)
Technical assistance for Project Conserve. Final report, 9:2591 (R;US)
**Training**
New York State Energy Office fuel-Oil Conservation Marketing Program. Final report, 9:2604 (R;US)
**ENERGY CONSUMPTION**
**Mathematical Models**
Analysis of medium-term economic development and energy consumptions through the EURECA-EXPLOR-EDM model chain. Final report, 9:2590 (R;XE)
**ENERGY DEMAND**
**Computer Codes**
Econometric estimates of the EDM model (Italian version of Frankfurt and Cambridge model), 9:2549 (R;XE)
**Economic Elasticity**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
**Energy Models**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
**Forecasting**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
Overview of the Wharton School assessments of the short-term integrated forecasting system (STIFS), 9:2532 (R;US)
**ENERGY MODELS**
**S Codes**
Overview of the Wharton School assessments of the short-term integrated forecasting system (STIFS), 9:2532 (R;US)
**ENERGY POLICY**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**Comparative Evaluations**
Analysis of the energy-political paths of the Enquete Commission, 9:2534 (R;DE;In German)
**ENERGY SOURCE DEVELOPMENT**
**Forecasting**
Potential production and consumption figures of indigenous fuels in Finland, 9:2571 (R;FI;In Finnish)
**Research Programs**
Energy Research Program. Final report, 1 September 1976-28 February 1982, 9:4232 (R;US)
**ENERGY SOURCES**
*See also FOSSIL FUELS*
*NUCLEAR FUELS*
*RENEWABLE ENERGY SOURCES*
*WOOD FUELS*
**Health Hazards**
Nuclear energy an unacceptable hazard to health, 9:2454 (J;GB)
**ENERGY STORAGE**
*See also HEAT STORAGE*
**Cost**
Breakeven costs of storage in optimized solar energy systems, 9:2147 (J;GB)
**Technology Assessment**
Assessment of energy storage for solar applications, 9:2145 (R;US)
**ENERGY SUPPLIES**
**Emergency Plans**
Analysis of the comprehensive energy emergency response procedures report, 9:2533 (R;US)
**ENERGY-LEVEL DENSITY**
**Boundary Conditions**
Density of states, Poisson's formula of summation and Walfisz's formula, 9:3745 (R;XA)
**ENERGY-LEVEL TRANSITIONS**
*See also EXCITATION*
**Probability**
To the theory of non-adiabatic transitions between degenerated states, 9:4001 (R;SU;In Russian)
**ENGINEERED SAFETY SYSTEMS**
*See also AIR CLEANING SYSTEMS*
*CONTAINMENT SYSTEMS*
**Availability**
Availability analysis of standby safety systems, 9:2501 (BA;US)
Practical availability analysis of standby systems, 9:2315 (J;US)
**Fault Tree Analysis**
Fault tree analysis using modular logic models, 9:2493 (BA;US)
**Fire Extinguishers**
Fire protection program in CANDU stations, 9:2426 (RA;CA)
**Fire Prevention**
Fire protection program in CANDU stations, 9:2426 (RA;CA)
**Risk Assessment**
Availability analysis of standby safety systems, 9:2501 (BA;US)
**Standards**
American National Standard: for safety-related cooling water systems in nuclear power plants, 9:2508 (B;US)
**Testing**
Practical availability analysis of standby systems, 9:2315 (J;US)
**ENGINEERING**
*See also NUCLEAR ENGINEERING*
**Microprocessors**
Engineering work stations in the national laboratory, 9:4247 (R;US)
**ENGINEERING GEOLOGY**
**Data Processing**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**ENGINEERING TEST FACILITY (TOKAMAK)**
*See TOKAMAK ETF*
**ENGLAND**
*See UNITED KINGDOM*
**ENHANCED RECOVERY**
**Field Tests**
Enhanced oil recovery: a strategy for improving domestic production, 9:1820 (R;US)
**Government Policies**
Enhanced oil recovery: a strategy for improving domestic production, 9:1820 (R;US)
**Research Programs**
Enhanced oil recovery: a strategy for improving domestic production, 9:1820 (R;US)
**Tracer Techniques**
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1821 (R;US)
**ENRICHED MATERIALS (ISOTOPES)**
*See ISOTOPE ENRICHED MATERIALS*
**ENRICHMENT (ISOTOPIC)**
*See ISOTOPE SEPARATION*
**ENTOMOLOGY**
*See INSECTS*
**ENVIRONMENTAL EXPOSURE CHAMBERS**
*See EXPOSURE CHAMBERS*

**ENVIRONMENTAL EXPOSURE PATHWAY**
**Mathematical Models**
Quantifying remarks to the question of uncertainties of the 'general dose assessment fundamentals', 9:3296 (R;DE;In German)
**ENVIRONMENTAL PARKS**
*See NATURE RESERVES*
**ENVIRONMENTAL PROTECTION AGENCY**
*See US EPA*
**ENZYMATIC HYDROLYSIS**
**Biochemical Reaction Kinetics**
Kinetic studies of enzymatic hydrolysis of insoluble cellulose: (II) analysis of extended hydrolysis times, 9:2126 (J;US)
**EOR**
*See ENHANCED RECOVERY*
**EPA**
*See US EPA*
**EPIPHYSIS (BONES)**
*See BONE TISSUES*
**EPR**
*See ELECTRON SPIN RESONANCE*
**EPR SPECTROMETERS**
**Pulse Generators**
Multipulse sequences in electron-spin echoes, 9:3215 (J;US)
**Pulse Techniques**
Multipulse sequences in electron-spin echoes, 9:3215 (J;US)
**EQUILIBRIUM PLASMA**
**Emission Spectra**
Calculation of spectrum line emission from plasmas, 9:4036 (R;GB)
**EQUIPMENT**
*Use of a more specific term is recommended.*
*See also DISTILLATION EQUIPMENT*
*ELECTRICAL EQUIPMENT*
*HEAT RECOVERY EQUIPMENT*
*MATERIALS HANDLING EQUIPMENT*
*THERMAL ENERGY STORAGE EQUIPMENT*
*X-RAY EQUIPMENT*
**Hardening**
DIRECT COURSE industrial hardening experiment and predictions, 9:3246 (RA;US)
**ERBIUM 150**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{148}$Gd, 9:3914 (J;US)
**ERBIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**ERBIUM BORIDES**
**Critical Field**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**Superconductivity**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**ERBIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**ESCA**
*See ELECTRON SPECTROSCOPY*
**ESR**
*See ELECTRON SPIN RESONANCE*
**ESTUARIES**
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**ESTUARINE ECOSYSTEMS**
*See AQUATIC ECOSYSTEMS*
**ETF (TOKAMAK)**
*See TOKAMAK ETF*
**ETHANE**
**Critical Temperature**
Electron attachment to oxygen in supercritical hydrocarbon fluids, 9:2976 (J;US)
**Electron Mobility**
Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3025 (R;DE;In German)
**Quantitative Chemical Analysis**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**Quantity Ratio**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**1,2-ETHANEDIAL**
*See GLYOXAL*
**ETHANOL**
**Adsorption**
Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2911 (R;DE;In German)
**Biosynthesis**
Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2128 (J;US)
**Production**
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2084 (R;US)
**Sorptive Properties**
Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2902 (J;US)
**ETHANOL PLANTS**
**By-Products**
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2084 (R;US)
**Economics**
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2084 (R;US)
**ETHERS**
**Decomposition**
Competing dissociation channels in the infrared multiphoton decomposition of ethyl vinyl ether, 9:3016 (J;US)
**Dissociation**
Competing dissociation channels in the infrared multiphoton decomposition of ethyl vinyl ether, 9:3016 (J;US)
**ETHINE**
*See ACETYLENE*
**ETHOCEL**
*See CELLULOSE ETHERS*
**ETHYL ALCOHOL**
*See ETHANOL*
**ETHYLENE**
**Chemical Reactions**
Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation, 9:2922 (J;US)
**ETHYLENE POLYMERS**
*See POLYETHYLENES*
**ETHYLENECARBOXYLIC ACID**
*See ACRYLIC ACID*
**ETHYLENEDIAMINETETRAACETIC ACID**
*See EDTA*
**ETHYNE**
*See ACETYLENE*
**EUCLIDEAN SPACE**
**Spinor Fields**
Spinor geometry: A genesis of extended supersymmetry, 9:4030 (R;XA)
**EURATOM**
Decree No. 524 of 8 June 1982 of the President of the Republic implementing CEC. Directive No. 77/576 for standardization of Member States' legislative, regulatory and administrative provisions on safety signs in workplaces and CEC Directive No. 79/640 amending the Annexes of the latter, 9:4265 (R;IT;In Italian)
**EUROPEAN ATOMIC ENERGY COMMUNITY**
*See EURATOM*

**EUROPEAN COMMUNITIES**
*See also COMMON MARKET*
*EURATOM*
**Research Programs**
Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies, 9:4235 (R;XE)
**EUROPEAN ECONOMIC COMMUNITY**
*See COMMON MARKET*
**EUROPIUM**
**Photoionization**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**Photon-Atom Collisions**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**EUROPIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**EVALUATED NUCLEAR DATA FILE**
*See NUCLEAR DATA COLLECTIONS*
**EVAPORATION**
**Measuring Instruments**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Measuring Methods**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**EVENT TREE ANALYSIS**
*See FAILURE MODE ANALYSIS*
**EXCHANGE (HEAT)**
*See HEAT TRANSFER*
**EXCHANGE (ION)**
*See ION EXCHANGE*
**EXCITATION**
**Random Phase Approximation**
Nuclear excitations in the nuclear response theory, 9:3945 (R;FR)
**EXHAUST GASES**
**Biological Effects**
Literature survey of the composition and of the acute effects of the exhaust gases of Diesel engines, 9:3261 (R;SE;In Swedish)
**Chemical Analysis**
Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82, 9:1853 (R;US)
**Exposure Chambers**
Services to operate and maintain a diesel exhaust exposure system for chronic animal inhalation exposure studies. Final report, 9:3413 (R;US)
**EXOTIC ATOMS**
*See HADRONIC ATOMS*
**EXPERIMENT PLANNING**
**Mathematical Models**
Two-level compromise designs for estimating main effects and detecting interactions, 9:4242 (R;US)
**EXPLOSIVE FRACTURING**
**Computerized Simulation**
Simulation and evaluation of explosive/propellant stimulation treatments, 9:1885 (RA;US)
**Cost Benefit Analysis**
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1891 (R;US)
**Field Tests**
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1891 (R;US)
**Optimization**
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1891 (R;US)
**EXPOSURE CHAMBERS**
**Operation**
Services to operate and maintain a diesel exhaust exposure system for chronic animal inhalation exposure studies. Final report, 9:3413 (R;US)
**EXPOSURE (RADIATION DOSES)**
*See RADIATION DOSES*
**EXTRACTION (BEAM)**
*See BEAM EXTRACTION*
**EXTRAPOLATION CHAMBERS**
**Calibration**
Properties of an extrapolation chamber for beta radiation dosimetry. Determination of calibration factors, 9:3172 (R;BR;In Portuguese)
**EXTREMELY HIGH FREQUENCY RADIATION**
*See MICROWAVE RADIATION*
**EXXON GASIFICATION PROCESS**
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)
**EZEIZA ARGENTINE RA-3 REACTOR**
*See RA-3 REACTOR*

## F

**F REGION**
**Nuclear Explosions**
High-latitude and equatorial research support for predicting high-altitude nuclear effects. Technical report, 9:3496 (R;US)
**Plasma Density**
Morphology of plasma density irregularities in the auroral f-region. Technical report, 9:3493 (R;US)
**Plasma Microinstabilities**
Microinstabilities in the high latitude F region: a brief review, 9:3498 (R;US)
**F-2030 RESONANCES**
**Hadronic Particle Decay**
Evidence for the F meson at 1970 MeV, 9:3730 (J;US)
**Mass Spectra**
Evidence for the F meson at 1970 MeV, 9:3730 (J;US)
**Particle Identification**
Evidence for the F meson at 1970 MeV, 9:3730 (J;US)
**FACE CENTERED CUBIC**
*See FCC LATTICES*
**FACILITIES (MILITARY)**
*See MILITARY FACILITIES*
**FACILITIES (NUCLEAR)**
*See NUCLEAR FACILITIES*
**FACILITIES (RESOURCE RECOVERY)**
*See RESOURCE RECOVERY FACILITIES*
**FACILITIES (STORAGE)**
*See STORAGE FACILITIES*
**FACILITIES (UNDERWATER)**
*See UNDERWATER FACILITIES*
**FAILED ELEMENT DETECTION**
**Gamma Spectroscopy**
Analysis of fission products in the Windscale A.G.R. coolant using on-line γ spectrometry, 9:2241 (R;XA)
**On-Line Measurement Systems**
Complex of hardware and software means for fission product detection in the fast reactor sodium coolant and cover gas, 9:2387 (R;SU;In Russian)
**FAILURE MODE ANALYSIS**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Mathematical Models**
Structures for common-cause failure analysis, 9:2500 (BA;US)
**FALLOUT**
*For radioactive fallout only.*
**Environmental Impacts**
Nuclear warfare water contamination. Technical report, 9:3327 (R;US)
**Forecasting**
DNAF-1: an analytical fallout prediction model and code. Final report 12 Mar 80-31 Oct 81, 9:3225 (R;US)
**FALLOUT PARTICULATES**
*See FALLOUT*
**FANS**
*See BLOWERS*
**FARADAY GENERATORS**
*See MHD GENERATORS*

**FARMS**
**Gas Appliances**
Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83, 9:1878 (R;US)
**FAST BREEDER TYPE REACTORS**
*See FBR TYPE REACTORS*
**FAST EXPERIMENTAL BREEDER REACTOR JAPAN**
*See JOYO REACTOR*
**FAST FLUX TEST FACILITY REACTOR**
*See FFTF REACTOR*
**FAST NEUTRONS**
**Radiation Streaming**
Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct, 9:3963 (R;JP)
**FAST-MIXED SPECTRUM REACTOR**
*See FBR TYPE REACTORS*
**FAULT TREE ANALYSIS**
**Computer Calculations**
Fault tree as a tool in safety analysis of nuclear power plants, 9:2420 (RA;CA)
**FAULT TREE SYSTEMS**
*See FAULT TREE ANALYSIS*
**FBR TYPE REACTORS**
*See also GCFR TYPE REACTORS*
*JOYO REACTOR*
*LMFBR TYPE REACTORS*
*PFR REACTOR*
**Education**
Experience with breeder reactor courses at the University of Virginia, 9:2286 (J;US)
**Educational Facilities**
Experience with FBR education in laboratory and short course settings, 9:2284 (J;US)
**Laboratories**
Experience with FBR education in laboratory and short course settings, 9:2284 (J;US)
**Nuclear Engineering**
Experience with breeder reactor courses at the University of Virginia, 9:2286 (J;US)
**Reactor Physics**
Experience with breeder reactor courses at the University of Virginia, 9:2286 (J;US)
**FCC LATTICES**
**Surface Properties**
Theoretical studies of surface diffusion: Self-diffusion in the fcc(100) system, 9:2726 (J;US)
**FEATHERS**
**Radionuclide Kinetics**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**FECES**
**Radiochemical Analysis**
Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen, 9:3391 (J;GB)
**FEDAL**
*See FAILED ELEMENT DETECTION*
**FEDERAL ENERGY REGULATORY COMMISSION**
*See US FERC*
**FEDERAL GOVERNMENT**
*See NATIONAL GOVERNMENT*
**FEDERAL REGION IV**
*Prior to June 1982 this concept was indexed to SOUTHEAST REGION.*
*See also NORTH CAROLINA*
**Human Populations**
Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities, 9:3338 (R;US)
**Sanitary Landfills**
Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities, 9:3338 (R;US)
**FEDERAL REGION X**
*Prior to June 1982 this concept was indexed to PACIFIC NORTHWEST REGION.*
**Solar Radiation**
Pacific Northwest solar radiation data, 9:3253 (R;US)
**FEDERAL REPUBLIC OF GERMANY**
**Electric Utilities**
Badenwerk - annual report 1982, 9:2568 (R;DE;In German)
**Energy Policy**
Analysis of the energy-political paths of the Enquete Commission, 9:2534 (R;DE;In German)
**Energy Supplies**
Analysis of the energy-political paths of the Enquete Commission, 9:2534 (R;DE;In German)
**Solar Rights**
Building laws and regulations and the utilization of solar energy in the Federal Republic of Germany, 9:2097 (RA;DE;In German)
**FEEDING**
**Multivariate Analysis**
Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis, 9:3280 (J;US)
**Seasonal Variations**
Seasonal foods of coyotes in southeastern Idaho: a multivariate analysis, 9:3280 (J;US)
**FEMALE GENITALS**
*See also UTERUS*
**Carcinomas**
Therapeutic effects of radiotherapy of carcinoma of corpus uteri and cervix in the years 1967-1972, 9:3355 (R;DE;In German)
**FERMENTATION**
**Optimization**
Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2128 (J;US)
**FERMENTATION ALCOHOL**
*See ETHANOL*
**FERMI RESONANCE**
**Comparative Evaluations**
Energetics of the Gamow-Teller resonances, 9:3941 (R;BR)
**FERMI STATISTICS**
**Mathematical Operators**
Formulae for configuration averages of products of one-body and two-body operators in many-fermion spaces, 9:4011 (R;US)
**FERMI-DIRAC STATISTICS**
*See FERMI STATISTICS*
**FERMILAB ACCELERATOR**
*Facility at Fermi National Accelerator Laboratory, Batavia, Illinois, includes main synchroton, booster synchrotron, and linac.*
**Radiation Monitoring**
Recent muon fluence measurements at Fermilab, 9:3966 (J;GB)
**FERMIONS**
*See also BARYONS*
*LEPTONS*
**Bound State**
Link fermions and dynamically correlated paths for lattice gauge theory, 9:3847 (J;NL)
**CP Invariance**
Time delay and the dyon charge, 9:3780 (J;US)
**Strong-Coupling Model**
Lattice gauge theories with Susskind fermions at strong coupling. Analytical method and results, 9:3818 (R;FR)
**FERRIC COMPOUNDS**
*See IRON COMPOUNDS*
**FERROELECTRIC CONVERTERS**
**Energy Losses**
Pyroelectric energy conversion: Hysteresis loss and temperature sensitivity of a ferroelectric material, 9:2587 (J;US)
**FERROMAGNETIC MATERIALS**
**Magnetization**
Thermodynamical properties of an Ising ferromagnet in a semi-infinite medium, 9:3517 (RA;BR;In Portuguese)
**FERROUS COMPOUNDS**
*See IRON COMPOUNDS*

**FERTILIZERS**
**Research Programs**
New developments in fertilizer technology, 9:2539 (R;US)
**FESHBACH-PORTER-WEISSKOPF MODEL**
*See OPTICAL MODELS*
**FEYNMAN DIAGRAM**
Introduction to Feynman graph calculations, 9:3820 (R;FR;In French)
**FEYNMAN PATH INTEGRAL**
**Invariance Principles**
Anomaly extraction from the path integral, 9:3799 (R;XA)
**Polynomials**
New approach to the calculation of multiloop Feynman diagrams: Gegenbauer polynomials technique in x space, 9:4010 (RA;SU;In Russian)
**FFTF REACTOR**
**Containment Systems**
Seismic analysis of a nonlinear airlock system, 9:2408 (R;US)
**Control Rooms**
Leak-rate qualification of the FFTF control area, 9:2337 (R;US)
**Leak Testing**
Leak-rate qualification of the FFTF control area, 9:2337 (R;US)
**Radiation Protection**
FFTF shield and gamma-ray measurements, 9:2377 (R;US)
**Reactor Vessels**
Thermal-buckling analysis of an LMFBR overflow vessel, 9:2407 (R;US)
**Scram**
Thermal-buckling analysis of an LMFBR overflow vessel, 9:2407 (R;US)
**Seismic Effects**
Seismic analysis of a nonlinear airlock system, 9:2408 (R;US)
**Shielding**
FFTF shield and gamma-ray measurements, 9:2377 (R;US)
**Transient Overpower Accidents**
Adjoint sensitivity analysis of extremum-type responses in reactor safety, 9:2466 (J;US)
**FIELD EQUATIONS**
*See also EINSTEIN FIELD EQUATIONS*
**Solitons**
Stability regions of one-dimensional solitons of a charged scalar field, 9:3832 (R;SU;In Russian)
**FIELD THEORIES**
*See also QUANTUM FIELD THEORY*
*UNIFIED-FIELD THEORIES*
**Self-Energy**
Simple rules for discontinuities in finite-temperature field theory, 9:3842 (J;US)
**Temperature Effects**
Simple rules for discontinuities in finite-temperature field theory, 9:3842 (J;US)
**FIELDS (ELECTROMAGNETIC)**
*See ELECTROMAGNETIC FIELDS*
**FIELDS (MAGNETIC)**
*See MAGNETIC FIELDS*
**FILAMENT (PLASMA)**
*See PLASMA FILAMENT*
**FILMS**
*Not for PHOTOGRAPHIC FILMS or NUCLEAR EMULSIONS.*
*See also SUPERCONDUCTING FILMS*
*THIN FILMS*
**Phase Transformations**
Floating phase in the chiral Potts model. A Monte Carlo renormalization-group analysis, 9:3986 (J;US)
**Sorptive Properties**
Floating phase in the chiral Potts model. A Monte Carlo renormalization-group analysis, 9:3986 (J;US)
**FILTERS (ELECTRIC)**
*See ELECTRIC FILTERS*
**FINLAND**
**District Heating**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Fossil-Fuel Power Plants**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
**Fuel Consumption**
Potential production and consumption figures of indigenous fuels in Finland, 9:2571 (R;FI;In Finnish)
**Fuel Supplies**
Potential production and consumption figures of indigenous fuels in Finland, 9:2571 (R;FI;In Finnish)
**Solid Fuels**
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples, 9:2093 (R;FI;In Finnish)
**Space Heating**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**FIRE PREVENTION**
Relationship of fire protection research to plant safety (PWR; BWR), 9:2452 (R;US)
**FIRE STATIONS**
*See PUBLIC BUILDINGS*
**FIREDAMP**
*See METHANE*
**FIRES**
Analysis of the large urban fire environment, 9:3232 (RA;US)
Project Flambeau experimental fire measurements, 9:3231 (RA;US)
**Computerized Simulation**
Modeling urban fire growth, 9:3239 (RA;US)
**Environmental Effects**
Effects of a controlled fire on small rodent populations in a sagebrush community, 9:3308 (RA;US)
Evaluating the effects of a prescribed burn on the foraging ecology of sage and Brewer's sparrows, 9:3306 (RA;US)
Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory, 9:3309 (RA;US)
**Flashover**
Flashover modeling for direct course, 9:3241 (RA;US)
**Hydrodynamics**
Hydrocode studies of flows generated by large area fires, 9:3228 (RA;US)
**Wind**
Wind-aided flame spread across strewn debris, 9:3238 (RA;US)
**FIREWOOD**
*See WOOD FUELS*
**FIRST WALL**
**Erosion**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**Impurities**
Identification and lattice location of low-Z impurities implanted into solids, 9:4172 (RA;JP;In Japanese)
**Materials Testing**
First wall and blanket engineering development for magnetic fusion reactors, 9:4213 (BA;XA)
**Performance**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**Radioactivation**
Potential low-level waste disposal limits for fusion radionuclides, 9:2060 (R;US)
**Sputtering**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**Surface Properties**
Progress in engineering simulation testing of fusion reactor first wall components, 9:4214 (BA;XA)
**Thermal Cycling**
Cyclic thermal stresses in fusion reactors, 9:4215 (BA;XA)
**Thermal Stresses**
Cyclic thermal stresses in fusion reactors, 9:4215 (BA;XA)

**FISCHER-TROPSCH SYNTHESIS**
**Catalysis**
Fischer-Tropsch catalysis. Annual report 1 Jun 81-31 May 82, 9:2076 (R;US)
**Catalysts**
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2070 (R;US)
**FISHES**
**Bacterial Diseases**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3402 (R;US)
**Biological Stress**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3402 (R;US)
**Blood Chemistry**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3402 (R;US)
**FISSILE MATERIALS**
**Criticality**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material, 9:3075 (B;US)
Calculational results compared to benchmark critical experiments on annular tanks, 9:2035 (J;US)
**Tanks**
Calculational results compared to benchmark critical experiments on annular tanks, 9:2035 (J;US)
**FISSION**
**Cross Sections**
Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3946 (R;JP)
**Nuclear Data Collections**
Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3946 (R;JP)
**Saddle-Point Method**
Effect of dissipation on the eigensolutions near the fission saddle point, 9:3951 (J;US)
**FISSION PRODUCT RELEASE**
*Coordinate with descriptors for the area of release such as BIOSPHERE or COOLANTS, and for the specific fission products, if known.*
Fission product behavior and containment response models for use in PRA studies, 9:2490 (BA;US)
**FISSION PRODUCTS**
**After-Heat**
JNDC nuclear data library of fission products, 9:3909 (R;JP)
**Beta Decay**
JNDC nuclear data library of fission products, 9:3909 (R;JP)
**Delayed Neutrons**
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3899 (R;US)
**Energy-Level Transitions**
JNDC nuclear data library of fission products, 9:3909 (R;JP)
**Neutron Reactions**
JNDC nuclear data library of fission products, 9:3909 (R;JP)
**Separation Processes**
Basic science and technology, 9:1928 (RA;US)
**FISSIONABLE MATERIALS**
*See also FISSILE MATERIALS*
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1924 (R;DE;In German)
**FISSIONABLE MATERIALS MANAGEMENT**
*See NUCLEAR MATERIALS MANAGEMENT*
**FISSURED FORMATIONS**
*See FRACTURED RESERVOIRS*
**FLAMES**
**Temperature Measurement**
Temperature measurement by two-line laser-saturated OH fluorescence in flames, 9:3052 (J;US)
**FLAMMABILITY**
**Measuring Methods**
Flammability testing state-of-the-art, 9:3087 (RA;US)
**FLASH TUBES**
**Power Supplies**
Optimized rotary flux compressors for powering laser flashlamps, 9:4190 (R;US)
**FLAVOR MODEL**
**Reviews**
Quark mixing in weak interactions, 9:3788 (J;NL)
**FLAVORDYNAMICS**
*See QUANTUM FLAVORDYNAMICS*
**FLOW (FLUID)**
*See FLUID FLOW*
**FLOWMETERS**
**Design**
Wide-range vortex shedding flowmeter for high-temperature helium gas, 9:2276 (R;US)
**FLUE GAS**
**Air Pollution Abatement**
Flue gas neutralization by adding gaseous ammonia, 9:2652 (R;FI;In Finnish)
**Desulfurization**
Computer economics of physical coal cleaning and flue gas desulfurization, 9:1798 (R;US)
Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83, 9:1797 (R;US)
Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes, 9:2968 (J;US)
**Vapor Condensation**
Flue gas neutralization by adding gaseous ammonia, 9:2652 (R;FI;In Finnish)
**FLUID FLOW**
*See also IDEAL FLOW*
*TWO-PHASE FLOW*
**Acceleration**
Time evolution of density perturbations in accelerating stratified fluids, 9:3604 (J;US)
**Computer Calculations**
Fully coupled calculation of fluid flows with limited use of computer storage, 9:3597 (R;US)
**Rayleigh-Taylor Instability**
Time evolution of density perturbations in accelerating stratified fluids, 9:3604 (J;US)
**FLUIDIZED BED**
**Corrosion**
Final report on fluidized bed materials. Stage 4, 9:3111 (R;SE;In Swedish)
**Erosion**
Final report on fluidized bed materials. Stage 4, 9:3111 (R;SE;In Swedish)
**FLUIDIZED-BED COMBUSTORS**
**Corrosion**
Final report on fluidized bed materials. Stage 4, 9:3111 (R;SE;In Swedish)
**Erosion**
Final report on fluidized bed materials. Stage 4, 9:3111 (R;SE;In Swedish)
**Materials Testing**
Fluidised-bed combustion project, Grimethorpe Experiment Facility: materials monitoring and evaluation plan for Test Series 2, 9:3107 (R;US)
**FLUIDS**
*Not for BODY FLUIDS.*
*See also GASES*
*GEOTHERMAL FLUIDS*
*LIQUIDS*
*WORKING FLUIDS*
**Compressibility**
Compressibility effect on instability growth rates, 9:3600 (J;US)

**Phase Studies**
Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures, 9:3214 (J;US)
**Phase Transformations**
Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures, 9:3214 (J;US)
**Rayleigh-Taylor Instability**
Compressibility effect on instability growth rates, 9:3600 (J;US)

**FLUORANTHENE**
*See CONDENSED AROMATICS*

**FLUORENE**
**Biological Effects**
Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital, 9:3421 (J;US)

**FLUORESCENCE**
Resonance fluorescence of a two-level atom near a metal surface. Technical report, 9:3505 (R;US)
**Uses**
Infrared fluorescence: a versatile probe of state-selected chemical dynamics, 9:2958 (J;US)

**FLUORIDES**
*See also AMERICIUM FLUORIDES*
*BERKELIUM FLUORIDES*
*BERYLLIUM FLUORIDES*
*COBALT FLUORIDES*
*CURIUM FLUORIDES*
*SILICON FLUORIDES*
*URANYL FLUORIDES*
*ZINC FLUORIDES*
**Quantitative Chemical Analysis**
Catalytic-kinetic micro trace determination of fluoride in environmental matrixes, 9:2896 (R;DE;In German)

**FLUORINE**
**Absorption Spectroscopy**
Direct absorption measurement of the spin-orbit splitting of the ground state in atomic fluorine, 9:3595 (J;NL)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Excitation**
Direct absorption measurement of the spin-orbit splitting of the ground state in atomic fluorine, 9:3595 (J;NL)

**FLUORINE 18**
**Radiochemistry**
$CF_4$-$H_2$-Ne gas target for reproducible high yields of anhydrous $H^{18}F$, 9:3045 (J;GB)

**FLUORINE FLUORIDES**
*See FLUORINE*

**FLUTE INSTABILITY**
**Stability**
Stabilization of electrostatic flute mode due to hot electron ring and rf field, 9:4062 (R;JP)

**FLUX (NEUTRON)**
*See NEUTRON FLUX*

**FLY ASH**
**Chemical Composition**
Basic science and technology, 9:1928 (RA;US)
Studies of the constitution of fly ash using selective dissolution. Final report, 9:1790 (R;US)
**Microstructure**
Preparation of ceramic particulates for transmission electron microscopy, 9:2671 (BA;US)
**Particle Size**
Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982, 9:1791 (R;US)
**Polycyclic Aromatic Hydrocarbons**
Analytical chemistry of polycyclic aromatic hydrocarbons present in coal-fired power plant fly ash, 9:2884 (R;US)
**Sample Preparation**
Sample collection and preparation methods affecting mutagenicity and cytotoxicity of coal fly ash, 9:3412 (R;US)
**Toxicity**
Sample collection and preparation methods affecting mutagenicity and cytotoxicity of coal fly ash, 9:3412 (R;US)

**FLYWHEEL-POWERED VEHICLES**
**Design**
Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report, 9:2668 (R;US)
**Mechanical Transmissions**
Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report, 9:2668 (R;US)
**Safety**
Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report, 9:2668 (R;US)
**Testing**
Flywheel energy-management systems for improving the fuel economy of motor vehicles. Final report, 9:2668 (R;US)

**FMIT FACILITY**
*See FMIT LINAC*

**FMIT LINAC**
*Linear Accelerator at the Hanford Fusion Materials Irradiation Test Facility.*
**Reviews**
FMIT: an accelerator-based neutron factory for fusion materials qualification, 9:4154 (R;US)

**FMRB REACTOR**
**Fuel Elements**
Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB, 9:2366 (RA;US)

**FNR REACTOR**
**Fuel Elements**
Core physics analysis in support of the FNR HEU-LEU demonstration experiment, 9:2367 (RA;US)
**Reactor Kinetics**
Core physics analysis in support of the FNR HEU-LEU demonstration experiment, 9:2367 (RA;US)
RERTR demonstration experiments program at the Ford Nuclear Reactor, 9:2368 (RA;US)

**FOKKER-PLANCK COEFFICIENTS**
*See FOKKER-PLANCK EQUATION*

**FOKKER-PLANCK EQUATION**
Transport and energy deposition of alpha particles. Fokker-PLanck equation treatment, 9:4141 (R;FR;In French)

**FOOD CHAINS**
**Biological Effects**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)
**Carbon 12**
Animal $^{13}C/^{12}C$ correlates with trophic level in pelagic food webs, 9:3322 (J;US)
**Carbon 13**
Animal $^{13}C/^{12}C$ correlates with trophic level in pelagic food webs, 9:3322 (J;US)
**Isotope Ratio**
Animal $^{13}C/^{12}C$ correlates with trophic level in pelagic food webs, 9:3322 (J;US)

**FORD NUCLEAR REACTOR**
*See FNR REACTOR*

**FORESTS**
**Mass Transfer**
Analysis of forest environmental measurements to estimate parameters of microclimate and air-pollution deposition-velocity models, 9:3259 (R;US)
**Visibility**
Source apportionment methods applied to the determination of the origin of ambient aerosols that affect visibility in forested areas, 9:3265 (R;US)

**FORMALDEHYDE**
**Atmospheric Chemistry**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)

**FORMALIN**
*See FORMALDEHYDE*

**FORMALITH**
*See FORMALDEHYDE*

**FORMAMIDE**
**Chemical Preparation**
Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2966 (J;US)
**Chemical Reaction Yield**
Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2966 (J;US)
**FORMIC ACID**
**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)
Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2966 (J;US)
**FORMIC ALDEHYDE**
*See FORMALDEHYDE*
**FORMOL**
*See FORMALDEHYDE*
**FORSCHUNGS UND MESSREAKTOR BRAUNSCHWEIG**
*See FMRB REACTOR*
**FORSCHUNGSREAKTOR BERLIN-2**
*See BER-2 REACTOR*
**FORSCHUNGSREAKTOR MUENCHEN**
*See FRM REACTOR*
**FOSSIL FUEL RESERVES**
*See FOSSIL FUELS*
**FOSSIL FUELS**
*See also COAL*
*NATURAL GAS*
*OIL SHALES*
*PEAT*
*PETROLEUM*
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Toxicity**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**FOSSIL-FUEL POWER PLANTS**
**Economizers**
Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach, 9:2184 (R;US)
**Environmental Effects**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
**Fuel Substitution**
Reclaiming lost capability in power plant coal conversions: an innovative, low-cost approach, 9:2184 (R;US)
**Offshore Sites**
Utilization of marginal offshore gas deposits by means of mobile offshore power stations, 9:1898 (BA;GB)
**Retrofitting**
Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada, 9:2185 (R;US)
**FOSSILS**
**Age Estimation**
Late-Pleistocene vegetation history of the Idaho National Engineering Laboratory, 9:3427 (RA;US)
**FOUNDATIONS**
**Construction**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report, 9:1822 (R;US)
**Design**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report, 9:1822 (R;US)
**FR-2 REACTOR**
**Reactor Decommissioning**
Pt. 1: Decommissioning of nuclear facilities. Pt. 2: Methods of decommissioning of nuclear facilities, 9:2382 (R;DE)
**FRACTURE MECHANICS**
**Fracture Properties**
Finite element part of the LAMCAL program. Elastic-plastic fracture mechanics applications, 9:2670 (R;XE)
**Meetings**
Lectures presented to the 14th meeting of the Study Group 'Fracture Mechanics' and to the 7th meeting of the Study Group 'Fatigue Strength', 9:2746 (B;DE;In German)
**FRACTURED FORMATIONS**
*See FRACTURED RESERVOIRS*
**FRACTURED RESERVOIRS**
**Flow Models**
Concepts and applications in modeling the Devonian shale (SUGAR and SUGAR-MD models), 9:1869 (RA;US)
**Reservoir Pressure**
Performance of wells in naturally fractured reservoirs, 9:1872 (RA;US)
**Simulation**
Simulation of Devonian shale infill drilling, 9:1888 (RA;US)
**FRAGMENTS (FALLOUT)**
*See FALLOUT*
**FRANCE**
**Nuclear Materials Diversion**
Decree No. 82-1050 of 13 December 1982 creating a Central Service for repression of illicit trading in weapons, munitions, explosive products and nuclear, biological and chemical materials, 9:2053 (R;FR;In French)
**Nuclear Power**
Legal regime for the nuclear electricity-generating policy in France, 9:4269 (B;FR;In French)
**FREE CONVECTION**
*See NATURAL CONVECTION*
**FREE RADICALS**
*See RADICALS*
**FRESH WATER ECOSYSTEMS**
*See AQUATIC ECOSYSTEMS*
**FRESNEL LENS**
**Performance Testing**
Linear Fresnel lens photovoltaic concentrator program, 9:2119 (R;US)
**FRICTION (INTERNAL)**
*See INTERNAL FRICTION*
**FRICTIONLESS FLOW**
*See IDEAL FLOW*
**FRM REACTOR**
**Fuel Elements**
Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB, 9:2366 (RA;US)
**FTR REACTOR (RICHLAND)**
*See FFTF REACTOR*
**FUEL ASSEMBLIES**
*See also FUEL ELEMENT CLUSTERS*
**Burnup**
Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2216 (R;US)
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2195 (R;US)
**Design**
Conceptual design of a fuel assembly for extended operational cycle length in LWRs, 9:2208 (J;US)
Fuel designs for light water reactors, 9:2228 (J;US)
Reliability breeds standardization in Combustion Engineering's fuel design, 9:2227 (J;US)
**Fuel Cycle**
Conceptual design of a fuel assembly for extended operational cycle length in LWRs, 9:2208 (J;US)

**Gamma Fuel Scanning**
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2195 (R;US)
**Heat Flux**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)
**Heat Transfer**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)
The TCLUST1 transient LMFBR intersubassembly heat transfer code, 9:2295 (J;US)
**Hydraulics**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)
**Identification Systems**
American National Standard: fuel-assembly identification, 9:2213 (B;US)
**Irradiation**
Fuel designs for light water reactors, 9:2228 (J;US)
**Performance Testing**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)
**Reliability**
Reliability breeds standardization in Combustion Engineering's fuel design, 9:2227 (J;US)
**Safeguards**
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)
**Thermal Stresses**
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2443 (R;US)

**FUEL BUNDLES**
*See FUEL ELEMENT CLUSTERS*

**FUEL CANS**
**Creep**
Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding, 9:2745 (J;US)
**Deformation**
Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding, 9:2745 (J;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)
**Oxidation**
Layer structures of oxide scales on zircaloy-4 tube exposed to steam-hydrogen mixture at high temperatures, 9:2333 (R;JP;In Japanese)
**Physical Radiation Effects**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)
**Stress Analysis**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)

**FUEL CELL POWER PLANTS**
*For commercial, residential, or electric utility use.*
**Economic Analysis**
Economic competitiveness of fuel cell onsite integrated energy systems, 9:2584 (R;US)
**Energy Efficiency**
On-site fuel-cell resource conservation in industrial-process applications. Final report, 9:2585 (R;US)

**FUEL CHANNELS**
**Deformation**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
**Design**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
**Heat Transfer**
Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2419 (RA;CA)
**Nondestructive Testing**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
**Performance Testing**
BWR fuel channels performance up to 2000 EFPD, 9:2209 (J;US)

**FUEL COOLING INSTALLATIONS**
*See SPENT FUEL STORAGE*

**FUEL CYCLE**
*See also PLUTONIUM RECYCLE*
*THORIUM CYCLE*
**Cost Benefit Analysis**
Operational and economic aspects of CANDU fuel cycles, 9:2270 (J;US)
**Implementation**
Operational and economic aspects of CANDU fuel cycles, 9:2270 (J;US)
**Research Programs**
Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983 (Oak Ridge National Laboratory), 9:4237 (R;US)
**Waste Management**
Waste management and the nuclear fuel cycle, 9:2312 (R;DE)

**FUEL ELEMENT CLUSTERS**
**Heat Transfer**
Method for calculating the temperature field in the fast reactor fuel assembly with random distribution of parameters by the Monte Carlo method, 9:2254 (R;SU;In Russian)
**Temperature Monitoring**
Temperature profile detector, 9:2334 (P;US)

**FUEL ELEMENT FAILURE**
**Probabilistic Estimation**
Application of experimental data to the estimation of fuel pin failure probability, 9:2292 (J;US)

**FUEL ELEMENTS**
*See also FUEL PINS*
*FUEL PLATES*
*FUEL RODS*
*SPENT FUEL ELEMENTS*
**Burnup**
Determination of burnup in irradiated nuclear fuels by the method of stable $^{148}Nd$ fission products, 9:2336 (B;BR;In Portuguese)
Non destructive burn up determination of IEA-R1 reactor fuel elements by gamma-ray spectrometry using a Ge(Li) detector, 9:2395 (B;BR;In Portuguese)
**Cost**
Economic projections for advanced fuel fabrication, 9:2331 (RA;US)
**Highly Enriched Uranium**
Comparison of some measurements in the Greek Research Reactor-1 (GRR-1) with 20% and 93% enriched uranium fuel elements, 9:2374 (RA;US)
**Irradiation**
Irradiation tests of fuel and fuel elements under the German AF program - revised test program, 9:2362 (RA;US)
Petten activities in the RERTR field, 9:2361 (RA;US)
**Materials Testing**
Note on experience with MTR fuel in the United Kingdom, 9:2350 (RA;US)
**Moderately Enriched Uranium**
Comparison of some measurements in the Greek Research Reactor-1 (GRR-1) with 20% and 93% enriched uranium fuel elements, 9:2374 (RA;US)
Contribution of French industry to RERTR (state of development in September 1980), 9:2356 (RA;US)
Core optimization studies at JEN - Spain, 9:2373 (RA;US)
Core physics analysis in support of the FNR HEU-LEU demonstration experiment, 9:2367 (RA;US)
Development of lower enrichment fuels for Canadian research reactors, 9:2357 (RA;US)
Improved capability of U-ZrH fuels, 9:2353 (RA;US)
Irradiation tests of fuel and fuel elements under the German AF program - revised test program, 9:2362 (RA;US)

JAERI RERTR program, 9:2348 (RA;US)
KUCA critical experiment program using HEU and MEU fuel, 9:2370 (RA;US)
LEU fuel development activities in Argentina, 9:2360 (RA;US)
Note on current position regarding the development by the UKAEA of reduced enrichment fuels for research and test reactors, 9:2359 (RA;US)
Objectives and status of the German AF program, 9:2347 (RA;US)
Possible ways and aspects of conversions for the German low power research reactors BER II, FRM, and FMRB, 9:2366 (RA;US)
Reduced enrichment activities in Denmark, 9:2358 (RA;US)
Status of RA3 conversion studies, 9:2371 (RA;US)
Study of $UO_2$ wafer fuel for very high-power research reactors, 9:2364 (RA;US)

**Performance**
Study of $UO_2$ wafer fuel for very high-power research reactors, 9:2364 (RA;US)

**FUEL GAS**
*See also NATURAL GAS*

**Hot Gas Cleanup**
Experimental simulation and advanced control aspects of the IGCC concept. Part I. Simulation results, 9:1751 (R;US)

**FUEL LOADING**
*See REACTOR FUELING*

**FUEL MANAGEMENT**
Burnup improvement through reshuffling of fuel bundles of the first fuel change in CANDU-600, 9:2263 (RA;CA)

**FUEL OILS**
*See also HEATING OILS*

**Resource Conservation**
New York State Energy Office fuel-Oil Conservation Marketing Program. Final report, 9:2604 (R;US)

**FUEL PELLETS**

**Fabrication**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)

**Injection**
Performance characterization of pneumatic single pellet injection system, 9:4146 (R;US)

**Quantitative Chemical Analysis**
Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis, 9:1921 (R;GB)

**FUEL PENCILS**
*See FUEL PINS*

**FUEL PINS**

**Burnup**
Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2282 (R;US)

**Chemical Composition**
Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2282 (R;US)

**Fabrication**
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)

**Fuel-Cladding Interactions**
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)

**Inspection**
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)

**Ionic Conductivity**
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)

**Isotope Ratio**
Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2282 (R;US)

**Moderately Enriched Uranium**
Neutronic performance of a 14 MW TRIGA reactor: LEU vs HEU fuel, 9:2369 (RA;US)

**On-Line Control Systems**
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)

**Performance Testing**
Performance of high plutonium weight fraction mixed-oxide fuel, 9:2293 (J;US)

**Post-Irradiation Examination**
Fabrication, irradiation and post-irradiation examinations of $MO_2$ and $UO_2$ sphere-pac and $UO_2$ pellet fuel pins irradiated in a PWR loop, 9:2218 (R;XE)

**Reliability**
Application of experimental data to the estimation of fuel pin failure probability, 9:2292 (J;US)

**FUEL PLATES**

**Fabrication**
Producibility studies using UAl/sub x/ for low enrichment fuel plates, 9:2354 (RA;US)

**Moderately Enriched Uranium**
Fabrication of highly-loaded low-enrichment uranium aluminide fuel plates, 9:2330 (RA;US)
Irradiation testing of miniature fuel plates for the RERTR program, 9:2352 (RA;US)
Producibility studies using UAl/sub x/ for low enrichment fuel plates, 9:2354 (RA;US)
Status of uranium-silicon alloy fuel development for the RERTR program, 9:2351 (RA;US)
Status of fuel element technology for plate type dispersion fuels with high uranium density, 9:2355 (RA;US)

**Performance**
Caramel fuel in OSIRIS: the complete conversion of a high flux research to a low enriched fuel, 9:2363 (RA;US)

**Specifications**
Irradiation testing of miniature fuel plates for the RERTR program, 9:2352 (RA;US)

**FUEL POOLS**

**Criticality**
Low-density moderation in PWR fuel storage, 9:2233 (J;US)

**FUEL REPROCESSING**
*See REPROCESSING*

**FUEL REPROCESSING PLANTS**
*See also WAK*
*WEST VALLEY PROCESSING PLANT*

**Aerosol Monitoring**
Air monitoring requirements and alarm response procedures in reprocessing plants, 9:1962 (RA;CA)

**Government Policies**
Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing, 9:1935 (B;DE;In German)

**Off-Gas Systems**
Canadian development program for off-gas management in nuclear facilities, 9:2255 (RA;XA)

**Public Opinion**
Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing, 9:1935 (B;DE;In German)

**Radiation Monitoring**
Air monitoring requirements and alarm response procedures in reprocessing plants, 9:1962 (RA;CA)

**Specifications**
Handling and storage of high-level liquid wastes from reprocessing of spent fuel, 9:1961 (R;DE)

**FUEL RODS**

**Damage**
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)

**Deformation**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)

**Reliability**
High-reliability PWR fuel, 9:2226 (J;US)

**Specifications**
High-reliability PWR fuel, 9:2226 (J;US)

**Thermal Conductivity**
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2400 (R;US)

**Thermal Stresses**
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)
**FUEL SHEATHS**
*See FUEL CANS*
**FUEL SLUGS**
*See FUEL RODS*
**FUEL SLURRIES**
**Combustion**
Development and evaluation of coal-water mixture combustion technology. Phase I. First quarterly report, 11 October 1980-10 January 1981, 9:3108 (R;US)
**FUEL SUBSTITUTION**
**Economic Impact**
Impacts of alcohol fuels on the US refining industry, 9:2641 (R;US)
**FUEL SUSPENSIONS**
*See FUEL SLURRIES*
**FUEL USE ACT**
*See POWER PLANT AND INDUSTRIAL FUEL USE ACT*
**FUEL-COOLANT INTERACTIONS**
**Heat Transfer**
Core melt/coolant interactions: modelling (PWR; BWR), 9:2447 (R;US)
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Hydraulics**
Core melt/coolant interactions: modelling (PWR; BWR), 9:2447 (R;US)
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Mathematical Models**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2277 (R;FR;In French)
**Test Facilities**
Core melt/coolant interactions: modelling (PWR; BWR), 9:2447 (R;US)
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Testing**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2277 (R;FR;In French)
**FUELS (NUCLEAR)**
*See NUCLEAR FUELS*
**FUELWOOD**
*See WOOD FUELS*
**FUGEN ATR**
*See JATR REACTOR*
**2-FURALALDEHYDE**
*See FURFURAL*
**FURFURAL**
**Market**
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2084 (R;US)
**FURNACE OIL**
*See HEATING OILS*
**FURNACES**
*See also OIL FURNACES*
**Air Pollution**
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
**Performance**
Tracer tests on furnaces at Metalloys Limited, 9:3110 (R;ZA)
**Tracer Techniques**
Tracer tests on furnaces at Metalloys Limited, 9:3110 (R;ZA)
**FUSION FUELS**
*See THERMONUCLEAR FUELS*
**FUSION (MELTING)**
*See MELTING*
**FUSION (NUCLEAR)**
*See THERMONUCLEAR REACTIONS*
**FUSION REACTORS**
*See THERMONUCLEAR REACTORS*

## G

**GADOLINIUM 146**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)
**GADOLINIUM 147**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)
**High Spin States**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)
**Nuclear Deformation**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)
**GADOLINIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**GADOLINIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**GADOLINIUM OXIDES**
**Fabrication**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)
**GALACTIC EVOLUTION**
**Cosmological Models**
Nonlinear evolution of large-scale structure in the universe, 9:3478 (J;US)
**GALAXY CLUSTERS**
**BBGKY Equation**
Four-point function in the BBGKY hierarchy, 9:3488 (J;US)
**Statistics**
Correlation functions in a filamentary clustering prescription, 9:3480 (J;US)
**GALAXY NUCLEI**
*Central part of galaxies.*
**Cosmological Models**
Activity in the centers of galaxies, 9:3490 (BA;DE)
**Luminosity**
Upper limits to the annihilation radiation luminosity of Centaurus A, 9:3461 (R;US)
**Plasma Jets**
An electron-positron jet model for the galactic center, 9:3457 (R;US)
**Spectra**
Low-temperature positron annihilation, 9:3460 (R;US)
**Stellar Radiation**
The origin of the galactic annihilation radiation, 9:3464 (R;US)
**GALLBLADDER**
*See BILIARY TRACT*
**GALLIUM ANTIMONIDES**
**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Ion Channeling**
Ion dechanneling due to lattice strains in semiconductor superlattices, 9:2852 (J;US)
**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**GALLIUM ARSENIDE SOLAR CELLS**
**Fabrication**
GaAs peeled-film solar cells. Final report, March 15, 1980-December 31, 1981, 9:2123 (R;US)

GALLIUM ARSENIDES
Backscattering
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
Capacitance
Impact ionization near GaAs grain boundaries, 9:2835 (J;US)
Chemical Bonds
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
Crystal Structure
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
Crystal-Phase Transformations
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
Electroluminescence
Impact ionization near GaAs grain boundaries, 9:2835 (J;US)
Electron Diffraction
Structure-factor phase information from two-beam electron diffraction, 9:2858 (J;US)
Electron Mobility
Electron mobilities in In/sub 0.2/Ga/sub 0.8/As/GaAs strained-layer superlattices, 9:2839 (J;US)
Ion Channeling
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
Strain measurements by channeling angular scans, 9:2830 (J;US)
Lattice Parameters
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
Phase Transformations
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
Photoluminescence
Photoluminescent properties of n-GaAs electrodes: applications of the dead-layer model to photoelectrochemical cells. Technical report, 9:2099 (R;US)
Sorptive Properties
Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2911 (R;DE;In German)
Strains
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
Strain measurements by channeling angular scans, 9:2830 (J;US)
Structure Factors
Structure-factor phase information from two-beam electron diffraction, 9:2858 (J;US)
Traps
Impact ionization near GaAs grain boundaries, 9:2835 (J;US)
GALLIUM IONS
Energy Levels
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
Oscillator Strengths
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
GALLIUM PHOSPHIDES
Charge Density
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
Chemical Bonds
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
Crystal Structure
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
Crystal-Phase Transformations
Structural properties of III-V zinc-blende semiconductors under pressure, 9:2848 (J;US)
Heterojunctions
GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications, 9:3104 (J;US)
Lattice Parameters
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
GALLSTONES
*See BILIARY TRACT*
GAMMA DETECTION
Energy Spectra
Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method, 9:3200 (B;BR;In Portuguese)
NaI Detectors
Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method, 9:3200 (B;BR;In Portuguese)
Solid Scintillation Detectors
Bismuth germanate as a high-energy gamma-ray detector, 9:3199 (J;US)
GAMMA DOSIMETRY
Chemical Dosemeters
Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment, 9:3169 (RA;XA)
GAMMA FUEL SCANNING
Ge Semiconductor Detectors
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2195 (R;US)
GAMMA RADIATION
Dose Rates
American National Standard: neutron and gamma-ray flux-to-dose rate factors, 9:3977 (B;US)
Radiation Streaming
Benchmark experiment on D-T neutrons and secondary gamma rays streaming through a concrete bent duct, 9:3963 (R;JP)
Stray Radiation
Calculation of stray dose distributions of gamma and X radiation in homogeneous and inhomogeneous media by means of Monte-Carlo methods, 9:3972 (B;DE;In German)
GAMMA SOURCES
*For cosmic sources of gamma radiation use COSMIC GAMMA SOURCES.*
Design
Cesium-137 gamma-source considerations for dry-sludge irradiators, 9:2066 (R;US)
GAMMA SPECTRA
A Codes
APPLE-2: an improved version of APPLE code for plotting neutron and gamma ray spectra and reaction rates, 9:3176 (R;JP)
GAMMA SPECTROMETERS
Corrections
Development of a method to correct for coincidence losses in high count rate gamma-ray spectrometry, 9:3175 (RA;CA)
Dead Time
Development of a method to correct for coincidence losses in high count rate gamma-ray spectrometry, 9:3175 (RA;CA)
Pulse Pileup
Development of a method to correct for coincidence losses in high count rate gamma-ray spectrometry, 9:3175 (RA;CA)
GAMMA SPECTROSCOPY
Monte Carlo Method
Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method, 9:3200 (B;BR;In Portuguese)
GAMOW-TELLER DECAY
*See GAMOW-TELLER RULES*
GAMOW-TELLER RULES
Comparative Evaluations
Energetics of the Gamow-Teller resonances, 9:3941 (R;BR)
GAMOW-TELLER THEORY
*See GAMOW-TELLER RULES*
GAS ANALYSIS
Gamma Spectrometers
Isotope specific noble gas monitoring, 9:3174 (RA;CA)
GAS COOLANTS
*See GASES*
GAS COOLED FAST BREEDER REACTOR
*See GCFR REACTOR*

**GAS COOLED FAST BREEDER REACTORS**
*See GCFR TYPE REACTORS*
**GAS FIELDS**
*See NATURAL GAS FIELDS*
**GAS FUELED REACTORS**
**Feasibility Studies**
Gaseous fuel reactors for power systems, 9:2298 (B;US)
**Research Programs**
Gaseous fuel reactors for power systems, 9:2298 (B;US)
**GAS SPILLS**
**Mathematical Models**
Recent results in simulating LNG vapor dispersion over variable terrain. Revision 1, 9:1880 (R;US)
**Monitoring**
LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices, 9:1879 (R;US)
**Remote Sensing**
BAGI: a new concept for the detection and tracking of hazardous gases, 9:1881 (R;US)
**GAS TRACK DETECTORS**
**Design**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Fabrication**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**GAS TURBINE ENGINES**
**Design**
Advanced Gas Turbine (AGT) powertrain system development for automotive applications, 9:2661 (R;US)
**Testing**
Advanced Gas Turbine (AGT) powertrain system development for automotive applications, 9:2661 (R;US)
**GAS UTILITIES**
**Rate Structure**
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
**GAS WELLS**
*See NATURAL GAS WELLS*
**GASEOUS EFFLUENTS**
*See GASEOUS WASTES*
**GASEOUS WASTES**
*See also EXHAUST GASES*
*FLUE GAS*
**Decontamination**
Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system, 9:2203 (RA;XA;In French)
**Denitrification**
Reduction of nitrogen monoxide by catalytically activated lignite coke, 9:1792 (R;DE;In German)
**Radioactive Waste Processing**
Treatment of concentrated waste for storage - fixation of concentrated gaseous waste, 9:1957 (R;DE)
**GASES**
*See also ELECTRON GAS and FERMI GAS.*
*See also AIR*
*ASSOCIATED GAS*
*EXHAUST GASES*
*FUEL GAS*
*RARE GASES*
*SYNTHESIS GAS*
**Adsorption**
Research programs in adsorption carried out in the low temperature laboratory of UFRJ (Brazil), 9:3522 (RA;BR;In Portuguese)
**Detection**
Improvements to gas detection systems, 9:1838 (BA;GB)
**Hygrometry**
Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2242 (R;XA)
**Purification**
Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83, 9:1874 (R;US)
**GASTEROPODS**
*See MOLLUSCS*
**GASTROINTESTINAL TRACT**
*See also INTESTINES*
**Radionuclide Kinetics**
Solutions for the ICRP gastrointestinal activity from inhaled radioactive aerosols (Man), 9:3400 (J;US)
**GAUGE INVARIANCE**
**Commutation Relations**
Quantization of gauge invariant theories through the Dirac bracket formalism, 9:4006 (R;BR)
**Feynman Path Integral**
Feynman rules for gauge fields in the presence of a dielectric medium, 9:3843 (J;US)
**GAUGE TRANSFORMATIONS**
*See GAUGE INVARIANCE*
**GCFR REACTOR**
**Reactor Core Disruption**
A comparison study of Response Surface Methodology and Differential Sensitivity Theory in core disruptive accident analysis, 9:2485 (BA;US)
**GCFR TYPE REACTORS**
*See also GCFR REACTOR*
**Breeding Blankets**
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1924 (R;DE;In German)
**Flowmeters**
Wide-range vortex shedding flowmeter for high-temperature helium gas, 9:2276 (R;US)
**Thorium Cycle**
Basic analyses and a comparison of the characteristics of the GCFR and the LMFBR with the thorium cycle in one - group diffusion theory, 9:2294 (B;BR;In Portuguese)
**GE SEMICONDUCTOR DETECTORS**
*See also LI-DRIFTED GE DETECTORS*
**Performance**
Extended Burnup Demonstration Reactor Fuel Program: development of an intrinsic germanium detector gamma-scan system, 9:2195 (R;US)
**GE(LI) DETECTORS**
*See LI-DRIFTED GE DETECTORS*
**GENE LOCI**
*See GENES*
**GENERATORS (RADIOISOTOPE)**
*See RADIOISOTOPE GENERATORS*
**GENERATORS (STEAM)**
*See STEAM GENERATORS*
**GENES**
**Molecular Structure**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3344 (R;US)
**GENITALS (FEMALE)**
*See FEMALE GENITALS*
**GENTILLY-2 REACTOR**
**Steam Generators**
In-situ rebuild of the Gentilly 2 steam generators, 9:2264 (RA;CA)
**GEOLOGIC ENGINEERING**
*See ENGINEERING GEOLOGY*
**GEOMAGNETIC FIELD**
**Daily Variations**
Sources of surface magnetic field variability. Final report, 9:3492 (R;US)
**Pulsations**
Geomagnetic pulsations-production/interpretation. Final scientific report 1 Sep 78-30 Sep 81, 9:3497 (R;US)
**GEORGES BANK**
**Ground Subsidence**
Thermal history of the Georges Bank Basin, 9:2153 (R;US)
**Temperature Gradients**
Thermal history of the Georges Bank Basin, 9:2153 (R;US)
**GEOTHERMAL AREAS**
*See GEOTHERMAL FIELDS*
**GEOTHERMAL DISTRICT HEATING**
Description and operation of Haakon School geothermal-heating system, 9:2174 (R;US)

**GEOTHERMAL ENERGY CONVERSION**
**Economics**
Economic utilization of geothermal energy, 9:2161 (R;DE;In German)
**GEOTHERMAL EXPLORATION**
*Exploration for sources of geothermal energy.*
Geothermal Progress Monitor report No. 8. Progress report, 9:2148 (R;US)
**GEOTHERMAL FIELDS**
*See also BRAWLEY GEOTHERMAL FIELD*
*BROADLANDS GEOTHERMAL FIELD*
*EAST MESA GEOTHERMAL FIELD*
*GEYSERS GEOTHERMAL FIELD*
*HEBER GEOTHERMAL FIELD*
*SALTON SEA GEOTHERMAL FIELD*
*WAIRAKEI GEOTHERMAL FIELD*
**Fluid Flow**
Heat transfer in fractured geothermal reservoirs with boiling, 9:2155 (J;US)
**Geology**
Community demonstration project: geothermal pair of wells at Latera. Final drilling report, 9:2157 (R;XE;In English and Italian)
**Heat Transfer**
Heat transfer in fractured geothermal reservoirs with boiling, 9:2155 (J;US)
**Radiometric Surveys**
Ngawha track etch survey 1981. Preliminary results, 9:2160 (R;NZ)
**Stable Isotopes**
Stable Isotope Group 1981 progress report, 9:2159 (R;NZ)
**GEOTHERMAL FLUIDS**
**Scaling**
Carbonate scaling - literature review and analysis, 9:2164 (R;US)
**Two-Phase Flow**
Two-phase flow studies, 9:2169 (R;US)
**GEOTHERMAL HEATING**
*See also GEOTHERMAL DISTRICT HEATING*
*GEOTHERMAL WATER HEATING*
**Environmental Impacts**
Direct-heat applications of geothermal energy in The Geysers/Clear Lake region. Volume II. Environmental assessment. Final report, 9:2162 (R;US)
**Feasibility Studies**
Direct heat applications of geothermal energy in The Geysers/Clear Lake region. Volume I. Geotechnical assessment, agribusiness applications, socioeconomic assessment, engineering assessment. Final report, 9:2173 (R;US)
**Information Dissemination**
Final administrative report for technology transfer and information dissemination, January 1, 1982-March 31, 1983, 9:2171 (R;US)
**Technology Transfer**
Final administrative report for technology transfer and information dissemination, January 1, 1982-March 31, 1983, 9:2171 (R;US)
**GEOTHERMAL HEATING SYSTEMS**
**Operation**
Description and operation of Haakon School geothermal-heating system, 9:2174 (R;US)
**Waste Disposal**
Description and operation of Haakon School geothermal-heating system, 9:2174 (R;US)
**GEOTHERMAL POWER PLANTS**
Geothermal Progress Monitor report No. 8. Progress report, 9:2148 (R;US)
**Operation**
Raft River 5MW(e) binary geothermal-electric power plant: operation and performance, 9:2163 (R;US)
**Performance**
Raft River 5MW(e) binary geothermal-electric power plant: operation and performance, 9:2163 (R;US)
**GEOTHERMAL PROCESS HEAT**
Geothermal Project. Final report, 9:2172 (R;US)
**Environmental Impacts**
Direct-heat applications of geothermal energy in The Geysers/Clear Lake region. Volume II. Environmental assessment. Final report, 9:2162 (R;US)
**GEOTHERMAL REGIONS**
*See GEOTHERMAL FIELDS*
**GEOTHERMAL SPRINGS**
*See THERMAL SPRINGS*
**GEOTHERMAL SYSTEMS**
**Scaling**
Carbonate scaling - literature review and analysis, 9:2164 (R;US)
**GEOTHERMAL WATER HEATING**
*Use for domestic water heating; for industrial application use GEOTHERMAL PROCESS HEAT.*
Geothermal Project. Final report, 9:2172 (R;US)
**GEOTHERMAL WELLS**
Geothermal Progress Monitor report No. 8. Progress report, 9:2148 (R;US)
**Flow Rate**
Community demonstration project: geothermal pair of wells at Latera. Final drilling report, 9:2157 (R;XE;In English and Italian)
**Testing**
Community demonstration project: geothermal well at Southampton. Final drilling report, 9:2167 (R;XE)
Community demonstration project: geothermal wells at Cesano. Final drilling report, 9:2158 (R;XE;In English and Italian)
**Water Pumps**
Geothermal pumping systems, 9:2168 (R;US)
**Well Completion**
Analysis of the conditions of geothermal drilling and completion (In French), 9:2166 (R;XE;In French)
Evaluation of direct-use-project drilling costs, 9:2165 (R;US)
**Well Drilling**
Analysis of the conditions of geothermal drilling and completion (In French), 9:2166 (R;XE;In French)
Community demonstration project: geothermal well at Southampton. Final drilling report, 9:2167 (R;XE)
Community demonstration project: geothermal wells at Cesano. Final drilling report, 9:2158 (R;XE;In English and Italian)
Evaluation of direct-use-project drilling costs, 9:2165 (R;US)
**Well Stimulation**
Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report, 9:2170 (R;US)
**Well Temperature**
Community demonstration project: geothermal pair of wells at Latera. Final drilling report, 9:2157 (R;XE;In English and Italian)
**GERMAN FEDERAL REPUBLIC**
*See FEDERAL REPUBLIC OF GERMANY*
**GERMAN FR ORGANIZATIONS**
*See also KERNFORSCHUNGSZENTRUM KARLSRUHE*
*WAK*
**Work**
Thirty-first to thirty-third annual report on the work of the Institut fuer Voelkerrecht at the Universitaet Goettingen. 1 April 1979 to 31 December 1981, 9:4270 (B;DE;In German)
**GERMANIUM**
**Absorption Spectra**
Direct free-hole absorption induced in germanium by 1.06 μm picosecond pulses, 9:2947 (J;US)
**Holes**
Three holes bound to a double acceptor: $Be^{+}$ in germanium, 9:2845 (J;US)
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**GERMANIUM 67**
**Energy Levels**
Level structure of $^{67}Ge$ and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)

**GERMANIUM 76 TARGET**
**Carbon 14 Reactions**
Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3893 (R;FR)
**GERMANIUM ALLOYS**
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Physical Radiation Effects**
Low temperature irradiations of iridium and of the compound $Nb_3Ge$ (Neutron irradiation), 9:2672 (R;FR;In French)
**GERMANIUM DETECTORS**
*See GE SEMICONDUCTOR DETECTORS*
**GERMANIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**GERMANY (FEDERAL REPUBLIC)**
*See FEDERAL REPUBLIC OF GERMANY*
**GERMS (MICROORGANISMS)**
*See MICROORGANISMS*
**GEYSERS GEOTHERMAL FIELD**
**Environmental Impacts**
Direct-heat applications of geothermal energy in The Geysers/Clear Lake region. Volume II. Environmental assessment. Final report, 9:2162 (R;US)
**GIANT RESONANCE**
Giant dipole resonances built on excited states, 9:3885 (R;US)
**Quasiparticle-Phonon Model**
Do spin and charge- exchange resonances possess a R(4)-symmetry, 9:3939 (R;BR)
**Reviews**
Some aspects of recent progress in the study of giant resonances, 9:3900 (R;FR;In French)
**Symmetry Groups**
Do spin and charge- exchange resonances possess a R(4)-symmetry, 9:3939 (R;BR)
**GLASS**
*See also BOROSILICATE GLASS*
**Ablation**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Annealing**
Rutherford backscattering evidence for solid phase laser annealing of Corning 7059 glass and ZnO thin films, 9:2866 (J;US)
**Chemical Radiation Effects**
Effect of $\gamma$ radiation on high-water-content glasses, 9:2870 (J;US)
**Coatings**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Infrared Spectra**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Inhalation**
Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3394 (J;GB)
**Ionic Conductivity**
Ionic conductivity and the weak electrolyte theory of glass, 9:2879 (J;NL)
**Leaching**
Coating of crystalline nuclear waste forms to improve inertness, 9:2039 (J;US)
Fabrication of high activity glasses in the cells VULCAIN and PIVER. Leaching at three temperatures of some of these glasses in the VULCAIN cell, 9:1946 (R;XE;In French)
**Neutron Diffraction**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Nondestructive Testing**
Development of CT techniques for integrity evaluation of vitrified solids, 9:2023 (J;US)
**Radiation Effects**
Coating of crystalline nuclear waste forms to improve inertness, 9:2039 (J;US)
**Radiolysis**
Rapid long range intramolecular electron transfer within a steroid molecule with two electron binding groups, 9:3028 (J;US)
**Raman Spectra**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Structure Factors**
Ab initio calculation of the vibrational spectra of $BeF_2$ glass simulated by molecular dynamics, 9:2837 (J;US)
**Vapor Deposited Coatings**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**GLAUBER THEORY**
**Matrix Elements**
Single-particle Glauber matrix elements, 9:3955 (J;US)
**GLUCOSE**
**Labelling**
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
**Metabolism**
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
**GLUCOSIDASE**
**Biochemical Reaction Kinetics**
Kinetic studies of enzymatic hydrolysis of insoluble cellulose: (II) analysis of extended hydrolysis times, 9:2126 (J;US)
**GLUEBALLS**
Glueballs, 9:3672 (RA;US)
**GLUONIUM**
*See GLUEBALLS*
**GLUONS**
**Propagator**
Gauge invariant Delbourgo approximation and gluon propagator, 9:3757 (RA;SU;In Russian)
**GLYCIDES**
*See SACCHARIDES*
**GLYOXAL**
**Photochemical Reactions**
Molecular beam study of the photochemistry of $S_1$ glyoxal, 9:3008 (J;US)
**GNEISSES**
**Permeability**
Investigation of fracture permeability around an underground opening in metamorphic rocks, 9:3435 (R;US)
**GOBAR GAS**
*See METHANE*
**GOLD**
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Excitation**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Ion Channeling**
Position-dependent stopping power for channeled ions, 9:3967 (J;US)
**Ion-Atom Collisions**
Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3507 (R;AU)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Raman Spectra**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)

**Sorptive Properties**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Voltametry**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**X-Ray Fluorescence Analysis**
Determination, by x-ray-fluorescence spectrometry, of gold and uranium on resin, 9:2892 (R;ZA)

**GOLD 197 TARGET**
**Alpha Reactions**
Projectile fragmentation and light particle emission from 70 MeV/nucleon $\alpha$ particles on $^{197}Au$, 9:3919 (R;FR)
**Neon 20 Reactions**
$^{20}Ne$ induced peripheral reaction at 30 MeV/nucleon, 9:3869 (R;FR)

**GOLD ALLOYS**
*See also GOLD BASE ALLOYS*
**Magnetic Moments**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)
**Magnetization**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)

**GOLD BASE ALLOYS**
**Phase Studies**
Metastable phase separation in Au-Fe alloys, 9:2714 (J;US)

**GOLD ISOTOPES**
**Beta Decay**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)
**Energy Levels**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)

**GOLDSTONE BOSONS**
*See also AXIONS*
**Symmetry Breaking**
Does nature like Nambu-Goldstone bosons, 9:3804 (R;XA)

**GRADED BAND GAP SOLAR CELLS**
*See CASCADE SOLAR CELLS*

**GRADED LIE GROUPS**
**Irreducible Representations**
Representations of osp(1,4) in terms of three boson pairs and matrices of arbitrary even order. Description of the method, 9:4032 (R;SU)
**Many-Dimensional Calculations**
Two-dimensional exactly and completely integrable dynamic systems (Monopoles, instantons, dual models, relativistic strings, Lund-Regge model, generalized Toda lattice, etc), 9:4031 (R;SU)
**Quantization**
Supergroup extensions: from central charges to quantization through relativistic wave equations, 9:3823 (R;XA)

**GRAFT POLYMERS**
**Irradiation**
Radiation induced modification of polyurethane for biomedical applications, 9:3026 (R;DE;In German)

**GRAIN ALCOHOL**
*See ETHANOL*

**GRAPHITE**
**Compression Strength**
Oxidation-related strength loss in HTGR graphites, 9:2249 (J;US)
**Fracture Mechanics**
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
**Manufacturing**
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
**Oxidation**
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
**Physical Radiation Effects**
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4165 (RA;JP;In Japanese)
**Sorptive Properties**
Physical adsorption and molecular dynamics, 9:2817 (RA;BR;In Spanish)
Study of krypton and xenon solid monoshells adsorbed in graphite by transmission electron diffraction, 9:2818 (RA;BR;In Spanish)
**Thermal Degradation**
Oxidation-related strength loss in HTGR graphites, 9:2249 (J;US)
**Wigner Effect**
Wigner effect in graphite stack: G2 and G3 reactors, 9:2814 (R;FR;In French)

**GRAPHITE MODERATOR**
*See GRAPHITE*

**GRASS**
**Ecological Succession**
Stability and succession in crested wheatgrass seedings on the Idaho National Engineering LAboratory, 9:3277 (RA;US)
**Ecology**
Comparison of three methods for estimating vegetal cover, 9:3302 (RA;US)
FActors affecting the distributions of two subspecies of big sagebrush, 9:3305 (RA;US)
New point interception frame for estimating cover of vegetation, 9:3276 (RA;US)
**Field Tests**
Stability and succession in crested wheatgrass seedings on the Idaho National Engineering LAboratory, 9:3277 (RA;US)
**Inventories**
Comparison of three methods for estimating vegetal cover, 9:3302 (RA;US)
New point interception frame for estimating cover of vegetation, 9:3276 (RA;US)
**Moisture**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
**Spatial Distribution**
FActors affecting the distributions of two subspecies of big sagebrush, 9:3305 (RA;US)

**GRATINGS**
**Nonlinear Optics**
Test of fidelity of phase conjugation, 9:4029 (J;US)

**GREAT BRITAIN**
*See UNITED KINGDOM*

**GREECE**
**Energy Analysis**
Greece - energy situation 1981/82, 9:2551 (R;DE;In German)
**Energy Policy**
Greece - energy situation 1981/82, 9:2551 (R;DE;In German)
**Power Generation**
Greece - energy situation 1981/82, 9:2551 (R;DE;In German)

**GREEK RESEARCH REACTOR**
*See DEMOCRITUS REACTOR*

**GREENHOUSES**
**Carbon Dioxide**
Charcoal based $CO_2$-generator for use in greenhouses, 9:2644 (R;NO;In Norwegian)
**Heating Systems**
Charcoal for warming and $CO_2$-supply in greenhouses - possible use, 9:2645 (R;NO;In Norwegian)
**Space Heating**
Charcoal based $CO_2$-generator for use in greenhouses, 9:2644 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2646 (R;NO;In Norwegian)

**GROUND SOURCE HEAT PUMPS**
**Design**
State-of-the-art survey of existing knowledge for the design of ground-source heat pumps, 9:2623 (R;US)
**Technology Assessment**
State-of-the-art survey of existing knowledge for the design of ground-source heat pumps, 9:2623 (R;US)

**GROUND WATER**
**Carcinogen Screening**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3284 (R;US)

**Contamination**
Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3321 (R;US)
**Heat Storage**
Heat storage in rock: Multiple well system, 9:2512 (R;US)
**Hydrology**
Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3321 (R;US)
**Manuals**
Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3321 (R;US)
**Mutagen Screening**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3284 (R;US)
**Radioactivity**
Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area, 9:3333 (R;US)
**Radionuclide Migration**
Radionuclide migration in transport paths bounded by the environment, 9:2020 (J;US)
Solubility-limited transport of radionuclides through fractured rock, 9:2018 (J;US)
**Sampling**
Groundwater contamination response guide. Volume 2. Desk reference. Final report Jun-Sep 82, 9:3321 (R;US)

**GROUND-WATER RESERVES**
*See AQUIFERS*

**GROUP CONSTANTS**
**Energy Dependence**
TIMS-PGG: a code system for producing group constants in fast neutron energy region, 9:2323 (R;JP;In Japanese)

**GRR REACTOR**
*See DEMOCRITUS REACTOR*

**GUARDS**
*See SECURITY PERSONNEL*

**GULF GENERAL ATOMIC FAST BREEDER REACTOR**
*See GCFR REACTOR*

**GULF OF MEXICO**
**Natural Gas Deposits**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)
**Petroleum Deposits**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)

## H

**HADRON REACTIONS**
**Glauber Theory**
Single-particle Glauber matrix elements, 9:3955 (J;US)

**HADRON-HADRON INTERACTIONS**
*See also BARYON-BARYON INTERACTIONS*
*MESON-BARYON INTERACTIONS*
**Glauber Theory**
Single-particle Glauber matrix elements, 9:3955 (J;US)
**Multiple Production**
Correlations and fluctuations in hadronic multiplicity distributions: The meaning of KNO scaling, 9:3786 (J;NL)
Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3734 (R;US)
**Nonlocal Potential**
Large angle scattering for nonlocal quasi-potentials, 9:3760 (RA;SU;In Russian)
**Quantum Chromodynamics**
Quantum chromodynamics in few-nucleon systems, 9:3773 (R;US)
**Quark Matter**
Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3770 (R;US)
**Quark Model**
Vector meson spin alignment in the fusion madel, 9:3766 (R;SU;In Russian)
**Regge Poles**
Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3734 (R;US)
**Research Programs**
Hadron physics at the SPS: Theoretical remarks, 9:3611 (RA;XC)

**HADRONIC ATOMS**
*See also MESIC ATOMS*
Exotic atoms and hyperon properties, 9:3695 (RA;US)
Hadronic atoms: the hadron-nucleus strong interaction, 9:3645 (RA;US)
**Fine Structure**
Precision measurement of the magnetic moment of the $\Sigma p$ hyperon, 9:3715 (J;US)
**X-Ray Spectra**
High-precision studies of exotic x rays from hadronic atoms with crystal diffraction spectrometers, 9:3648 (RA;US)
$K^-$ and $\Sigma^-$ atoms and $p(K^-,\gamma)$, 9:3646 (RA;US)
Magnetic moment of the negative sigma hyperon: sigma hyperon-nucleus interactions, 9:3696 (RA;US)
Omega-minus atoms, 9:3697 (RA;US)
Precision measurement of the magnetic moment of the $\Sigma^-$ hyperon, 9:3715 (J;US)
Sigma-minus hydrogenic atoms, 9:3647 (RA;US)

**HADRONS**
*See also BARYONS*
*MESONS*
**Flavor Model**
Properties of scalar constituents of hadrons with respect to SU(2)sub(L)xU(1) group, 9:3807 (R;SU)
**Mass Spectra**
Hadron spectroscopy, 9:3756 (R;BR;In Portuguese)
**Particle Models**
Collective vs atomic models of the hadrons, 9:3776 (R;IL)
**Particle Production**
Inclusive spectra of hadrons in photon-nucleus collisions, 9:3736 (R;SU)
**Particle Structure**
Problem of the deuteron smearing corrections - 1: the conventional approach, 9:3744 (R;XA)
**Quark Model**
Hadron spectroscopy, 9:3756 (R;BR;In Portuguese)
Nonlocal quark model, 9:3809 (RA;SU;In Russian)

**HAFNIUM 164**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{146}Gd$, 9:3914 (J;US)

**HALL GENERATORS**
*See MHD GENERATORS*

**HALOGENS**
*See also CHLORINE*
*FLUORINE*
*IODINE*
**Photoacoustic Spectroscopy**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)

**HANDLING (DATA)**
*See DATA PROCESSING*

**HANDLING (WASTES)**
*See WASTE MANAGEMENT*

**HANFORD RESERVATION**
**Radiation Monitoring**
PUREX environmental radiological surveillance - preoperational and operational support program conducted by Pacific Northwest Laboratory, 9:3274 (R;US)

**HARWELL PLUTO REACTOR**
*See PLUTO REACTOR*

**HAWAII**
**Geothermal Wells**
The Hawaii geothermal project: phytotoxicity of geothermal separator brine, an exploratory study, 9:3417 (J;NL)

**HAZARDOUS MATERIALS**
*Not for radioactive materials.*

**Transport**
Questionable practices in the selection of transportation services for small lots of hazardous or sensitive cargo, 9:2528 (R;US)
**Waste Disposal**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3284 (R;US)
Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities, 9:3338 (R;US)

**HAZARDOUS MATERIALS SPILLS**
**Environmental Impacts**
Environmental assessment for spill tests of $NH_3$ and $N_2O_4$ at Frenchman Flat, Nevada Test Site. Revision 1, 9:3267 (R;US)
**Remote Sensing**
BAGI: a new concept for the detection and tracking of hazardous gases, 9:1881 (R;US)

**HCDA**
*See REACTOR CORE DISRUPTION*

**H-COAL PROCESS**
**Materials Testing**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Measuring Instruments**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Pilot Plants**
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1753 (R;US)
**Pressure Vessels**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Valves**
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1753 (R;US)

**HD 8077**
*See NICKEL BASE ALLOYS*

**HDO**
*See HEAVY WATER*

**HEALTH PHYSICS**
*See RADIATION PROTECTION*

**HEAT DISSIPATION**
*See HEAT TRANSFER*
*THERMAL EFFLUENTS*

**HEAT EXCHANGERS**
**Design**
High temperature active heat exchanger research for latent heat storage, 9:2514 (R;US)
**Efficiency**
Evaluation of an air-to-air heat exchanger, 9:2629 (J;GB)
**Plastics**
Heat technological investigations on plastic heat exchangers for dry type natural draught cooling towers, 9:2188 (R;DE;In German)
**Tubes**
Tubing for augmented heat transfer, 9:2647 (R;US)

**HEAT FLUX**
*See also CRITICAL HEAT FLUX*
**Analytical Solution**
Heat flux in the presence of shifting cold and hot electron Maxwellian distributions, 9:4061 (R;JP)

**HEAT PUMPS**
*See also GROUND SOURCE HEAT PUMPS*
**Coefficient of Performance**
Metal-hydride heat-pump performance studies, 9:2613 (R;US)
**Comparative Evaluations**
Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2657 (R;SE;In Swedish)
**Computerized Simulation**
Design of compression heat pumps driven by diesel engines for domestic heating systems, 9:2615 (R;DE;In German)
**Design**
Optimization of a combustion motor driven heat pump (gas/oil) for power ranges up to 20kW thermal with variable sources of environmental energy in one- and two-family-houses (small heat pump), 9:2611 (R;XE;GE)
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
**Performance Testing**
Design of compression heat pumps driven by diesel engines for domestic heating systems, 9:2615 (R;DE;In German)
**Testing**
Optimization of a combustion motor driven heat pump (gas/oil) for power ranges up to 20kW thermal with variable sources of environmental energy in one- and two-family-houses (small heat pump), 9:2611 (R;XE;GE)

**HEAT RECOVERY EQUIPMENT**
**Corrosion**
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2648 (R;US)
**Materials**
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2648 (R;US)

**HEAT RESISTANT MATERIALS**
*See also HEAT RESISTING ALLOYS*
**Research Programs**
1981 Annual status report. High-temperature materials, 9:2680 (R;XE)

**HEAT RESISTING ALLOYS**
*See also ALLOY-A-286*
*STAINLESS STEEL-304*
*STAINLESS STEEL-304L*
*STAINLESS STEEL-316*
**Carburization**
The kinetics of high-temperature carburization in HTGR atmospheres, 9:2251 (J;US)
**Thermal Degradation**
The kinetics of high-temperature carburization in HTGR atmospheres, 9:2251 (J;US)

**HEAT STORAGE**
*See also SENSIBLE HEAT STORAGE*
**Feasibility Studies**
Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2511 (R;XE;FR)
**Mathematical Models**
Mathematical modeling of TES subsystems, 9:2513 (R;US)

**HEAT STORAGE DEVICES**
*See THERMAL ENERGY STORAGE EQUIPMENT*

**HEAT STORAGE SYSTEMS**
*See THERMAL ENERGY STORAGE EQUIPMENT*

**HEAT TRANSFER**
**Calculation Methods**
Numerical solution to the steady state equation of transfer in azimuthally symmetric geometries, 9:3083 (R;US)

**HEAT TRANSFER PROPERTIES**
*See THERMODYNAMIC PROPERTIES*

**HEAT TRANSMISSION**
*See HEAT TRANSFER*

**HEATED EFFLUENTS**
*See THERMAL EFFLUENTS*

**HEATER OIL**
*See HEATING OILS*

**HEATING LOAD**
**Data Compilation**
Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices, 9:2608 (R;US)

**HEATING OILS**
**Cocombustion**
RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2086 (R;US)
**Prices**
State Heating Oil Grants Program. Final report, September 1, 1982-May 31, 1983, 9:1850 (R;US)

**HEATING SYSTEMS**
*See also GEOTHERMAL HEATING SYSTEMS*
**Control Equipment**
Basic characteristics of low-cost houses in order to reduce the energy consumption for heating: efficiency of heating plants

and controls. Final report, January 1978-September 1980, 9:2610 (R;XE)

**Energy Efficiency**
Energy economical improvement of an oil heating system, 9:2625 (R;FI;In Finnish)

**HEAVY ION ACCELERATORS**
*Includes combined accelerator types for heavy ion acceleration.*
*See also HHIRF*

**Specifications**
Cyclotron facility for acceleration of heavy ions to 20-120 MeV/nucleon, 9:3120 (R;SU;In Russian)

**Targets**
Preparation and characterization of heavy ion targets, 9:3159 (J;US)

**HEAVY ION REACTIONS**
*See also CALCIUM 40 REACTIONS*
*CARBON 12 REACTIONS*
*CARBON 13 REACTIONS*
*CARBON 14 REACTIONS*
*DEEP INELASTIC HEAVY ION REACTIONS*
*IRON 56 REACTIONS*
*LITHIUM 6 REACTIONS*
*NEON 20 REACTIONS*
*NICKEL 64 REACTIONS*
*NITROGEN 14 REACTIONS*
*OXYGEN 16 REACTIONS*
*OXYGEN 18 REACTIONS*

**Fission**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)

**Fragmentation**
Z dependence of strongly interacting relativistic nuclear fragments, 9:3915 (J;US)

**Hydrodynamic Model**
Phase transitions in nuclear matter and consequences for neutron stars, 9:3949 (R;DD)

**Multiple Production**
Experiments with nuclear beams and targets, 9:3618 (RA;XC)

**Quark Matter**
Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3770 (R;US)

**S Matrix**
Multiple Coulomb excitation effects in heavy ion compound and fusion cross sections, 9:3940 (R;BR)

**HEAVY IONS**
*Whenever possible use one of the more specific terms listed under ION BEAMS.*

**Stopping Power**
Stopping power and effective charge of low-velocity ions in metals, 9:4171 (RA;JP;In Japanese)

**HEAVY NUCLEI**
*For nuclei from mass 181 upwards.*
*See also ASTATINE 201*
*ASTATINE 203*
*BISMUTH 214*
*LEAD 206*
*LEAD 210*
*PLATINUM 195*
*PLATINUM 197*
*RADIUM 218*
*RADIUM 225*
*RADIUM 226*
*RADON 222*

**Nuclear Deformation**
Phenomenology of shape transitions in hot nuclei, 9:3948 (R;IL)

**HEAVY OILS**
*See PETROLEUM*

**HEAVY WATER**

**Photoelectron Spectroscopy**
K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields, 9:2847 (J;US)

**Photoionization**
K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields, 9:2847 (J;US)

**Production**
Feed cycles for the industrial production of heavy water through multiphoton dissociation of fluoroform, 9:2063 (J;US)

**Raman Spectra**
Raman and infrared spectroscopic studies of the structure of water ($H_2O$, HOD, $D_2O$) in stoichiometric crystalline hydrates and in electrolyte solutions, 9:3528 (R;DE)

**HEAVY WATER COOLANT**
*See HEAVY WATER*

**HEAVY WATER MODERATED AND WATER COOLED RE**
*See HWLWR TYPE REACTORS*

**HEAVY WATER MODERATOR**
*See HEAVY WATER*

**HEBER GEOTHERMAL FIELD**

**Resource Development**
Imperial County geothermal development annual meeting: summary, 9:2150 (R;US)

**HELIUM**

**Atom-Atom Collisions**
Concerning a long-lived (²P/sup e/)$He^-$ state: Lifetime and energy-level measurements of $He^-$, 9:3562 (J;US)

**Autoionization**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)

**Desorption**
Angular distribution of desorpted atoms of solid surfaces, 9:2819 (RA;BR;In Spanish)

**Electron Correlation**
Classification of doubly excited states of two-electron atoms, 9:3554 (J;US)

**Electron Drift**
Electron drift velocities in gas mixtures of He, $N_2$, and $CO_2$, 9:2863 (J;US)

**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)

**Excited States**
Classification of doubly excited states of two-electron atoms, 9:3554 (J;US)

**Hadronic Atoms**
Sigma-minus hydrogenic atoms, 9:3647 (RA;US)

**Impurities**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)

**Ion-Atom Collisions**
Level crossing studies on ion-collisionally excited He atoms in electric and magnetic fields, 9:3596 (B;DE;In German)

**Kapitza Resistance**
Kapitza resistance theory, 9:3526 (RA;BR;In Portuguese)

**Moisture**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)

**Resonance**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)

**Trace Amounts**
Helium approach to leak detection, 9:2189 (J;US)

**HELIUM 3**

**Compressibility**
Thermal expansion, velocity of sound, and compressibility in liquid $^3$He under pressure, 9:3602 (J;US)

**D States**
Effects of the $^3$He D state in the reaction $^3$H(p,γ)$^3$He, 9:3867 (J;US)

**Effective Mass**
Effective mass and the specific heat of normal liquid $^3$He, 9:3601 (J;US)

**Sound Waves**
Thermal expansion, velocity of sound, and compressibility in liquid $^3$He under pressure, 9:3602 (J;US)

**Specific Heat**
Effective mass and the specific heat of normal liquid $^3$He, 9:3601 (J;US)

**Thermal Expansion**
Thermal expansion, velocity of sound, and compressibility in liquid $^3$He under pressure, 9:3602 (J;US)

**HELIUM 3 REACTIONS**
**Quasi-Elastic Scattering**
Momentum spectra of light nuclei in reactions Ad → AX at large momentum transfers, 9:3862 (R;SU)
**HELIUM 3 TARGET**
**Proton Reactions**
Rate of the $^3$He(p, e$^+$ ν)$^4$He reaction, 9:3474 (J;US)
**HELIUM 4 REACTIONS**
*See ALPHA REACTIONS*
**HELIUM II**
*The phase of liquid helium-4 which is stable at temperatures between absolute zero and the lambda point (about 2.2 K).*
**Hydrodynamics**
Transient behavior of rotating superfluid helium, 9:3608 (J;US)
**Nucleation**
Quantum nucleation of solids, 9:3606 (J;US)
**Phase Transformations**
Quantum nucleation of solids, 9:3606 (J;US)
**Vortices**
Transient behavior of rotating superfluid helium, 9:3608 (J;US)
**HELIUM IONS**
**Autoionization**
Concerning a long-lived (²P/sup e/)He⁻ state: Lifetime and energy-level measurements of He⁻, 9:3562 (J;US)
**Collisions**
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)
**Energy Levels**
Concerning a long-lived (²P/sup e/)He⁻ state: Lifetime and energy-level measurements of He⁻, 9:3562 (J;US)
**Energy Losses**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Energy-Level Transitions**
Concerning a long-lived (²P/sup e/)He⁻ state: Lifetime and energy-level measurements of He⁻, 9:3562 (J;US)
Deuteron forward photodisintegration: meson currents and relativity, 9:3866 (R;US)
**Ion Emission**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)
**Ion-Atom Collisions**
Level crossing studies on ion-collisionally excited He atoms in electric and magnetic fields, 9:3596 (B;DE;In German)
**Reflection**
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)
**Trapping**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)
**HELIUM METHOD**
*See ISOTOPE DATING*
**HELIUM-NEON LASERS**
**Electric Discharges**
He-Ne laser in hollow cathode discharge, 9:3081 (BA;AT)
**Hollow Cathodes**
He-Ne laser in hollow cathode discharge, 9:3081 (BA;AT)
**HETEROCYCLIC OXYGEN COMPOUNDS**
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**HFR REACTOR**
**Fuel Elements**
Petten activities in the RERTR field, 9:2361 (RA;US)
**Reactor Operation**
1981 Annual Status Report. Operation of the high flux reactor, 9:2375 (R;XE)
**Research Programs**
Annual report 1981. Joint Research Centre Petten Establishment, 9:2376 (R;XE)
**HHIRF**
**Accelerator Facilities**
Heavy ions, targets, and research at HHIRF, 9:3141 (R;US)
**Targets**
Heavy ions, targets, and research at HHIRF, 9:3141 (R;US)
**HIGGS BOSONS**
**Bound State**
Do light colored scalars exist?, 9:3848 (J;US)
**Yukawa Potential**
Detailed calculation of the complete two-loop Higgs-Yukawa beta function in an arbitrary α gauge, 9:3778 (J;US)
**HIGH ALTITUDE (STRATOSPHERE)**
*See STRATOSPHERE*
**HIGH ENERGY PHYSICS**
*Use only for articles of a very broad nature such as an annual research program, etc.*
**Computers**
High-energy physics, 9:3609 (J;US)
**HIGH ENERGY RADIOTHERAPY**
*See RADIOTHERAPY*
**HIGH EXPLOSIVES**
*See CHEMICAL EXPLOSIVES*
**HIGH FLUX REACTOR PETTEN**
*See HFR REACTOR*
**HIGH PRESSURE COOLANT INJECTION**
*See HPCI*
**HIGH SPIN STATES**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**HIGH TEMPERATURE GAS COOLED AND GRAPHITE**
*See HTGR TYPE REACTORS*
**HIGH VOLTAGE DIRECT CURRENT SYSTEMS**
*See HVDC SYSTEMS*
**HIGH-BETA PLASMA**
*Beta from 0.1 to 1.*
**Ballooning Instability**
Experimental study of high-beta tokamak stability, 9:4118 (J;US)
High-beta neoclassical current and stability experiments, 9:4127 (BA;XA)
**Equilibrium**
Experimental study of high-beta tokamak stability, 9:4118 (J;US)
**Magnetic Probes**
High-beta tokamak plasma physics studies, 9:4132 (BA;XA)
**Thomson Scattering**
High-beta tokamak plasma physics studies, 9:4132 (BA;XA)
**HIGH-FREQUENCY HEATING**
*See also ECR HEATING*
*ICR HEATING*
*LOWER HYBRID HEATING*
Plasma properties and ion heating in EBT-S and hot electron rings at TRW, 9:4130 (BA;XA)
**Hybridization**
Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4064 (R;JP)
**Numerical Solution**
Analysis of current drive by travelling wave based on theory of intrinsic stochasticity, 9:4065 (R;JP)
**HIGH-LEVEL RADIOACTIVE WASTES**
**Calcination**
Volatilization and trapping of ruthenium during calcination of nitric acid solutions, 9:1954 (RA;XA)
**Computerized Simulation**
Simulated HLLW compositions for cold test of waste management development, 9:1986 (R;JP)
**Inventories**
High-level waste description, inventory and hazard, 9:1942 (R;US)
**Leaching**
Coating of crystalline nuclear waste forms to improve inertness, 9:2039 (J;US)
Leach testing of INEL waste forms in a gamma field, 9:2022 (J;US)

**Packaging**
Initial specifications for nuclear waste package external dimensions and materials, 9:1999 (R;US)
**Radiation Hazards**
High-level waste description, inventory and hazard, 9:1942 (R;US)
**Radioactive Waste Processing**
Handling and storage of high-level liquid wastes from reprocessing of spent fuel, 9:1961 (R;DE)
**Radioactive Waste Storage**
Experience with the storage of high active waste at WAK, 9:1940 (R;DE)
**Vitrification**
Off-gas treatment for HLLW-vitrification techniques using a liquid-fed ceramic waste glass melter, 9:1955 (RA;XA)
Volatilization and trapping of ruthenium during calcination of nitric acid solutions, 9:1954 (RA;XA)

**HISTONES**
**Chromatography**
Histone fractionation by high-performance liquid chromatography, 9:3348 (J;US)
**Fractionation**
Histone fractionation by high-performance liquid chromatography, 9:3348 (J;US)

**HOG FUEL**
*See WOOD WASTES*

**HOLIFIELD HEAVY ION RESEARCH FACILITY**
*See HHIRF*

**HOLMIUM 165 TARGET**
**Iron 56 Reactions**
Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon, 9:3891 (J;US)

**HOLOGRAPHY**
**Data Processing**
Approach to real-time holography, 9:4246 (R;US)

**HORMONES**
**Diagnosis**
Angiography of hormone producing tumours of pancreas, 9:3358 (RA;HU;In Hungarian, English)

**HOT GAS CLEANUP**
Desulfurization of hot reductive gases by means of metal oxides, 9:1767 (R;DE;In German)

**HOT LABS**
Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980, 9:2384 (R;JP;In Japanese)

**HOT PLASMA**
**Distribution Functions**
Role of the hot-electron distribution function in the stability of the ELMO Bumpy Torus, 9:4108 (J;US)
**Interferometry**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Plasma Pressure**
Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability, 9:4107 (J;US)
**Soft X Radiation**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Stability**
Anisotropic pressure and finite hot-electron Larmor radius effects on hot-electron ring stability, 9:4107 (J;US)

**HOT WATER HEATERS**
*See WATER HEATERS*

**HOUSEHOLDS**
**Surveys**
Technical assistance for Project Conserve. Final report, 9:2591 (R;US)

**HOUSES**
**Attached Greenhouses**
Solar architecture of the Log-id team - experiences from the experimental greenhouse in Tuebingen, architects' solutions for residential buildings, 9:2137 (RA;DE;In German)
Vegetation systems as components of buildings with passive energy systems, 9:2598 (RA;DE;In German)
**Energy Balance**
Short description of the research project 'building and energy', 9:2599 (RA;DE;In German)
**Energy Conservation**
Moisture and home energy conservation: how to detect, solve and avoid related problems, 9:2602 (R;US)
Solar architecture of the Log-id team - experiences from the experimental greenhouse in Tuebingen, architects' solutions for residential buildings, 9:2137 (RA;DE;In German)
Technical assistance for Project Conserve. Final report, 9:2591 (R;US)
Transforming design concepts into energy-conscious architecture, 9:2600 (RA;DE;In German)
**Energy Consumption**
Basic characteristics of low-cost houses in order to reduce the energy consumption for heating: efficiency of heating plants and controls. Final report, January 1978-September 1980, 9:2610 (R;XE)
Calculation approaches for energy evaluation of buildings, 9:2594 (RA;DE;In German)
**Energy Efficiency**
Performance of three solar houses, 9:2141 (R;FI;In Finnish)
**Heat Losses**
Calculation approaches for energy evaluation of buildings, 9:2594 (RA;DE;In German)
**Landscaping**
Vegetation systems as components of buildings with passive energy systems, 9:2598 (RA;DE;In German)
**Moisture**
Moisture and home energy conservation: how to detect, solve and avoid related problems, 9:2602 (R;US)
**Passive Solar Cooling Systems**
Vegetation systems as components of buildings with passive energy systems, 9:2598 (RA;DE;In German)
**Passive Solar Heating Systems**
Collecting environmental energy with construction, 9:2138 (RA;DE;In German)
Development tendencies of passive systems, 9:2596 (RA;DE;In German)
Transforming design concepts into energy-conscious architecture, 9:2600 (RA;DE;In German)
**Solar Architecture**
Experiences with projects and competitions - demonstration projects for solar energy utilization in residential buildings, 9:2136 (RA;DE;In German)
Solar architecture of the Log-id team - experiences from the experimental greenhouse in Tuebingen, architects' solutions for residential buildings, 9:2137 (RA;DE;In German)
**Solar Space Heating**
Performance of three solar houses, 9:2141 (R;FI;In Finnish)

**HPCI**
**Heat Transfer**
Feasibility study on feed and bleed for pressurized-water reactors, 9:2403 (R;US)
**Hydraulics**
Feasibility study on feed and bleed for pressurized-water reactors, 9:2403 (R;US)

**HTGR TYPE REACTORS**
*See also THTR-300 REACTOR*
*VHTR REACTOR*
**Coated Fuel Particles**
Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2435 (R;DE;In German)
Fuel performance models for high-temperature gas-cooled reactor core design, 9:2239 (R;US)
Irradiation performance of LEU fuel particle designs, 9:2247 (J;US)
TRISO-coated HTGR fuel pressure-vessel performance models, 9:2238 (R;US)
**Computerized Simulation**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)
**Dynamic Loads**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)

**Fuel Assemblies**
Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant, 9:2314 (J;US)
**Fuel Cycle**
Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant, 9:2314 (J;US)
**Reactor Accidents**
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
**Reactor Core Restraints**
SONATINA-2V: a computer program for seismic analysis of the two-dimensional vertical slice HTGR core, 9:2244 (R;JP)
**Reactor Materials**
Materials selection for advanced-HTGR component development, 9:2250 (J;US)
Oxidation-related strength loss in HTGR graphites, 9:2249 (J;US)
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
The kinetics of high-temperature carburization in HTGR atmospheres, 9:2251 (J;US)
**Reactor Operation**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)
**Reactor Safety**
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
**Transients**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)

**HTO**
*See HEAVY WATER*
*TRITIUM COMPOUNDS*

**HUGENHOLTZ-PINES THEORY**
*See HYDROGEN*

**HUMAN POPULATIONS**
**Mental Disorders**
Effects of the accident at Three Mile Island on the mental health and behavioral responses of the general population and nuclear workers, 9:2455 (J;GB)
**Radiation Doses**
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1821 (R;US)
Quantifying remarks to the question of uncertainties of the 'general dose assessment fundamentals', 9:3296 (R;DE;In German)

**HUMANS**
*See HUMAN POPULATIONS*

**HUMIC ACIDS**
**Chemical Reactions**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)

**HVDC SYSTEMS**
*69 to 230 kV.*
**Cryogenic Cables**
Some characteristics of dielectric materials at cryogenic temperatures for HVDC systems, 9:2193 (J;US)

**HWLWR TYPE REACTORS**
*See also JATR REACTOR*
**Planning**
Role of Fugen HWR in Japan and design of a 600 MWe demonstration reactor, 9:2269 (R;JP)

**HYDRATED ELECTRONS**
*See SOLVATED ELECTRONS*

**HYDRATES**
*For chemical compounds or minerals.*
**Latent Heat Storage**
Research opportunities in salt hydrates for thermal energy storage (Bibliography and glossary included), 9:2515 (R;US)

**HYDRAULIC FRACTURES**
**Crack Propagation**
Containment of hydraulic fractures in coal seams by in situ stresses, 9:1801 (RA;US)
**Dimensions**
Design of hydraulic fracturing treatments, 9:1887 (RA;US)

**HYDRAULIC FRACTURING**
**Computerized Simulation**
Development of a 3-D simulator for hydraulic fracturing (Computer code HYFRAC), 9:1884 (RA;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)
**Mathematical Models**
Design of hydraulic fracturing treatments, 9:1887 (RA;US)
Hydraulic fracture simulator theory and application, 9:1883 (RA;US)
Status of technology associated with hydraulic fracture modeling, 9:1886 (RA;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)
**Reviews**
Status of technology associated with hydraulic fracture modeling, 9:1886 (RA;US)
**Simulators**
Hydraulic fracture simulator theory and application, 9:1883 (RA;US)
**Three-Dimensional Calculations**
Development of a 3-D simulator for hydraulic fracturing (Computer code HYFRAC), 9:1884 (RA;US)

**HYDRAULIC RAMS**
*See PUMPS*

**HYDRAULIC TURBINES**
**Pumps**
Pumps-as-turbines experience profile, 9:2186 (R;US)

**HYDRIDES**
*See also ALUMINIUM HYDRIDES*
*LITHIUM HYDRIDES*
*NIOBIUM HYDRIDES*
*SCANDIUM HYDRIDES*
*SILANES*
*SILVER HYDRIDES*
*TANTALUM HYDRIDES*
*VANADIUM HYDRIDES*
*ZIRCONIUM HYDRIDES*
**PH Value**
Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2955 (J;US)

**HYDROCARBONS**
*See also ALKANES*
*ALKENES*
*ALKYNES*
*AZULENE*
*BENZANTHRACENE*
*BENZENE*
*BENZOPYRENE*
*FLUORENE*
*NAPHTHALENE*
*POLYCYCLIC AROMATIC HYDROCARBONS*
*POLYENES*
*PYRENE*
*TETRALIN*
*TOLUENE*
**Chemical Analysis**
Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82, 9:1853 (R;US)
**Chemical Preparation**
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
**Electron Mobility**
Quasifree electron mobility by the method of partial waves in liquid hydrocarbons and in fluid argon, 9:2832 (J;US)
**Electronic Structure**
Comment on ab initio calculation of spin densities in hydrocarbon radicals, 9:3571 (J;US)
**Fischer-Tropsch Synthesis**
Olefin addition in Fischer-Tropsch synthesis on an iron catalyst, 9:2988 (J;US)
**Hyperfine Structure**
Comment on ab initio calculation of spin densities in hydrocarbon radicals, 9:3571 (J;US)
**Photochemical Reactions**
Turbine engine exhaust hydrocarbon analysis. task 1 and 2. Interim report Jan-Sep 82, 9:1853 (R;US)

**Radicals**
Comment on ab initio calculation of spin densities in hydrocarbon radicals, 9:3571 (J;US)
**Radiolysis**
A pulse radiolysis study of the excitation of nitrogen and aromatic hydrocarbons in rare gas-additive mixtures: Evidence for subexcitation electron interactions, 9:3032 (J;US)
**Separation Processes**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)

**HYDROCHLORIC ACID**
**Chemical Properties**
Factors affecting the preparation of misted clay feed and solids-liquid separation after HC leaching. Report of investigations, 9:3285 (R;US)
**Chemical Reaction Kinetics**
Kinetics of the Cl—$H_2$ system. II. Abstraction vs exchange in D+HCl, 9:2949 (J;US)
Variational transition state theory and tunneling for a heavy—light—heavy reaction using an ab initio potential energy surface. $^{37}Cl+H(D)\ ^{35}Cl \rightarrow H(D)\ ^{37}Cl+^{35}Cl$, 9:2943 (J;US)
**Chemical Reaction Yield**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)
**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)

**HYDROELECTRIC POWER PLANTS**
**Environmental Effects**
Effects of operating the Mt. Elbert Pumped-Storage Powerplant on Twin Lakes, Colorado: 1981 report of findings. Technical report, 9:2094 (R;US)

**HYDROFLUORIC ACID**
**Dipole Moments**
Semiclassical inversion procedure for the dipole-moment function for diatomic molecules, 9:3575 (J;US)
**Labelling**
$CF_4$-$H_2$-Ne gas target for reproducible high yields of anhydrous $H^{18}F$, 9:3045 (J;GB)
**Molecule-Molecule Collisions**
Tests of the quasiclassical trajectory cross-correlation moment method against accurate quantum dynamics for V—V energy transfer in HF—HF collisions, 9:3588 (J;US)
**Nuclear Reaction Yield**
$CF_4$-$H_2$-Ne gas target for reproducible high yields of anhydrous $H^{18}F$, 9:3045 (J;GB)

**HYDROGEN**
**Adsorption**
Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2082 (J;US)
Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2911 (R;DE;In German)
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Atom-Molecule Collisions**
Accurate calculations of the rate constants and kinetic isotope effects for tritium-substituted analogues of the H + $H_2$ reaction, 9:2931 (J;US)
Spectral distribution of $CO_2$ vibrational states produced by collisions with fast hydrogen atoms from laser photolysis of HBr, 9:3586 (J;US)
System-bath decomposition of the reaction path Hamiltonian. II. Rotationally inelastic reactive scattering of H+$H_2$ in three dimensions, 9:3553 (J;US)
**Binary Mixtures**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983 (Methane, carbon dioxide, carbon monoxide, hydrogen: binary mixtures with organic solvents; ASPEN; also properties of pure organic solvents with equations), 9:1761 (R;US)
**Chemical Analysis**
Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2888 (R;NZ)
**Chemical Bonds**
Strain-induced localization and electronically stimulated desorption and dissociation, 9:2840 (J;US)
**Chemical Reaction Kinetics**
Reduced dimensionality quantum rate constants for the D+$H_2$(v = 0) and D+$H_2$(v = 1) reactions on the LSTH surface, 9:2916 (J;US)
**Chemical Reaction Yield**
Formation of hydrogen atoms in pyrolysis of 2,2-dimethylpropane behind shock waves, 9:2978 (J;US)
Molecular beam study of the photochemistry of $S_1$ glyoxal, 9:3008 (J;US)
**Chemical Reactions**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
Improved parametrization of diatomics-in-molecules potential energy surface for $Na(3p\ ^2P)+H_2 \rightarrow Na(3s\ ^2S)+H_2$, 9:2953 (J;US)
System-bath decomposition of the reaction path Hamiltonian. II. Rotationally inelastic reactive scattering of H+$H_2$ in three dimensions, 9:3553 (J;US)
**Chemisorption**
Chemisorption of atomic hydrogen in nickel, 9:2690 (RA;BR;In Portuguese)
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
Hydrogen chemisorption on silicon (100) 2 x 1, 9:2759 (J;NL)
**Combustion**
Research on equipment survival in a hydrogen burn, 9:2453 (R;US)
**Consumption Rates**
Dissolution of coal in solvents, 9:1777 (D;US)
Investigations of reactor performance, role of inherent catalysts, hydrogen donor solvents, and PCT properties of coal liquids and slurries, 9:1762 (R;US)
**Desorption**
Angular distribution of desorpted atoms of solid surfaces, 9:2819 (RA;BR;In Spanish)
Strain-induced localization and electronically stimulated desorption and dissociation, 9:2840 (J;US)
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Diffusion**
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2701 (R;DE;In German)
**Dissociation Energy**
Preparation and reactions of $Cr^-$. The Cr-H bond strength, 9:3029 (J;US)
**Electronic Structure**
Molecular clustering about a positive ion. Structures, energetics, and vibrational frequencies of the protonated hydrogen clusters $H^+_3$, $H^+_5$, $H^+_7$, and $H^+_9$, 9:3580 (J;US)
**Hadronic Atoms**
Sigma-minus hydrogenic atoms, 9:3647 (RA;US)
**Ion-Atom Collisions**
Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules, 9:3563 (J;US)
Isotope effect in electron-capture differential cross sections at intermediate energies, 9:3593 (J;US)
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3509 (R;US)

**Ion-Molecule Collisions**
Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules, 9:3563 (J;US)
**Isotope Ratio**
Conversion of water to hydrogen for deuterium assay using uranium at 700 deg. C., 9:2888 (R;NZ)
**Mixing**
Hydrogen mixing in compartments with a high-velocity source, 9:2409 (R;US)
**Muonic Atoms**
Muon capture from the triplet hyperfine level in hydrogen (LAMPF II experiment planning), 9:3705 (RA;US)
**Phase Studies**
Vapor liquid equilibrium study of the $H_2CH_4$ system at low temperatures and elevated pressures. Research report (annual) Jan-Dec 79, 9:2077 (R;US)
**Photoelectron Spectroscopy**
Resonant multiphoton ionization of $H_2$ via the B $^1\Sigma^+$/sub u/, v = 7, J = 2 and 4 levels with photoelectron energy analysis, 9:3567 (J;US)
**Photoionization**
Resonant multiphoton ionization of $H_2$ via the B $^1\Sigma^+$/sub u/, v = 7, J = 2 and 4 levels with photoelectron energy analysis, 9:3567 (J;US)
**Raman Effect**
Observation of solitons in stimulated Raman scattering, 9:3558 (J;US)
**Separation Processes**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)
**Vibrational States**
Molecular clustering about a positive ion. Structures, energetics, and vibrational frequencies of the protonated hydrogen clusters $H^+_3$, $H^+_5$, $H^+_7$, and $H^+_9$, 9:3580 (J;US)

**HYDROGEN 1 TARGET**
**Neutron Reactions**
Weak nucleon-nucleon interaction in few body systems, 9:3861 (R;FR)
**Proton Reactions**
Energy variation of the analyzing power in the reaction p/sub pol/+p→d+$\pi^+$, 9:3728 (J;US)

**HYDROGEN 2**
*See DEUTERIUM*

**HYDROGEN 3**
*See TRITIUM*

**HYDROGEN CHLORIDES**
*See HYDROCHLORIC ACID*

**HYDROGEN EMBRITTLEMENT**
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2701 (R;DE;In German)

**HYDROGEN FLUORIDES**
*See HYDROFLUORIC ACID*

**HYDROGEN HYDROXIDES**
*See WATER*

**HYDROGEN IONS**
*See also HYDROGEN IONS 1 MINUS*
*HYDROGEN IONS 1 PLUS*
*HYDROGEN IONS 2 PLUS*
**Ion Emission**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)
**Trapping**
Data on trapping and re-emission of energetic hydrogen isotopes and helium in materials, 9:3962 (R;JP)

**HYDROGEN IONS 1 MINUS**
*For $H_1^-$ ions.*
**Ion-Atom Collisions**
Electron detachment for $H^-$ ($D^-$) in collisions with Ne, 9:3549 (J;US)

**HYDROGEN IONS 1 PLUS**
*For $H_1^+$ ions.*
**Collisions**
Empirical formulas for the reflection of light ions from solids, 9:4168 (RA;JP)
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)
Reflection of low energy light-element ions from solid surfaces, 9:4169 (RA;JP;In Japanese)
**Desorption**
Strain-induced localization and electronically stimulated desorption and dissociation, 9:2840 (J;US)
**Ion-Atom Collisions**
Isotope effect in electron-capture differential cross sections at intermediate energies, 9:3593 (J;US)
Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3507 (R;AU)
**Quantity Ratio**
Technique to increase the $H^+$ ion fraction in a multicusp source, 9:4099 (J;US)
**Reflection**
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)

**HYDROGEN IONS 2 PLUS**
*For $H_2^+$ ions.*
**Collisions**
Generation of vibrationally excited $H_2$ molecules by $H_2^+$ wall collisions, 9:3540 (R;US)

**HYDROGEN LOGS**
*See NEUTRON-NEUTRON LOGGING*

**HYDROGEN NITRATES**
*See NITRIC ACID*

**HYDROGEN PEROXIDE**
**Excitation**
State-to-state unimolecular reaction dynamics. Technical progress report, 9:2999 (R;US)

**HYDROGEN PHOSPHATES**
*See PHOSPHORIC ACID*

**HYDROGEN PRODUCTION**
**Biophotolysis**
Biotechnology and environmental programs, 9:3388 (RA;US)
**Catalysts**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
**Thermochemical Processes**
High temperature solar-thermochemical processing-hydrogen and sulfur from hydrogen sulfide, 9:2129 (J;GB)
Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides, 9:2109 (R;US)

**HYDROGEN SILICATES**
*See SILICIC ACID*

**HYDROGEN STORAGE**
**Cost**
Investigation into hydrogen storage with cryoadsorbents and comparison of alternative hydrogen storage methods, 9:2068 (R;US)
**Niobium Hydrides**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Tantalum Hydrides**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)

**HYDROGEN SULFATES**
*See SULFURIC ACID*

**HYDROGEN SULFIDES**
**Chemical Reactions**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy, 9:1899 (BA;GB)

**HYDROGENATION**
**Catalysts**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)

**HYDROLOGY**
**Tracer Techniques**
Radioactive tracers in geothermal underground water flow studies, 9:2152 (R;NZ)

**HYDROMAGNETIC WAVES**
*See also ALFVEN WAVES*
**Research Programs**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**HYDROXYL IONS**
*See ANIONS*
**HYDROXYL RADICALS**
**Fluorescence**
Temperature measurement by two-line laser-saturated OH fluorescence in flames, 9:3052 (J;US)
**Infrared Spectra**
Measurement of vibration-rotation line strengths of HO using a tunable diode laser, 9:3552 (J;US)
**Oscillator Strengths**
Measurement of vibration-rotation line strengths of HO using a tunable diode laser, 9:3552 (J;US)
**HYDROXYLAMINE**
**Chemical Reaction Kinetics**
Reaction of nitrite ion with hydroxylamine-N-sulfonate in aqueous solution, 9:2959 (J;US)
**HYDROXYNAPHTHALENES**
*See NAPHTHOLS*
**HYDROXYTOLUENES**
*See CRESOLS*
**HYPERFRAGMENTS**
*See HYPERNUCLEI*
**HYPERNUCLEI**
Hyperon-nucleon interactions, 9:3659 (RA;US)
**Energy Levels**
Experiments with Λ hypernuclei, 9:3640 (RA;US)
How to populate bound hypernuclear levels, 9:3644 (RA;US)
Hypernuclei, 9:3636 (RA;US)
Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
Studies of narrow Σ-hypernuclear structure, 9:3643 (RA;US)
**Isotope Production**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**Nuclear Magnetic Moments**
Measurement of $^{13}C$ magnetic moment, 9:3641 (RA;US)
**Nuclear Structure**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**Production**
ΞN scattering as a probe of the strong interaction, 9:3661 (RA;US)
Hypernuclei, 9:3636 (RA;US)
Possible investigations of the ($K^-$, $K^+$) reaction, 9:3642 (RA;US)
**Shell Models**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**Weak Particle Decay**
Weak decay of lambda hypernuclei, 9:3639 (RA;US)
**Y*Resonances**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
**HYPERON BEAMS**
**Beam Production**
Polarizion experiments with hyperons, 9:3694 (RA;US)
$XI^0$ experiments, 9:3693 (RA;US)
**Polarized Beams**
Polarizion experiments with hyperons, 9:3694 (RA;US)
**HYPERONS**
*See also LAMBDA PARTICLES*
*SIGMA PARTICLES*
*XI PARTICLES*
**Bound State**
Are there bound A = 2 hyperon states, 9:3662 (RA;US)
Exotic atoms and hyperon properties, 9:3695 (RA;US)
Search for a possible strangeness S = -2 dibaryon, 9:3637 (RA;US)
**Energy-Level Transitions**
Electromagnetic decays of hyperon-excited states, 9:3769 (RA;US)
**Magnetic Moments**
Exotic atoms and hyperon properties, 9:3695 (RA;US)
Magnetic moments of baryons, 9:3777 (R;IL)
**Mass**
Exotic atoms and hyperon properties, 9:3695 (RA;US)
**Weak Particle Decay**
Hyperon decays, 9:3691 (RA;US)

## I

**IAEA SAFEGUARDS**
**Measuring Instruments**
IAEA experience with authentication of in-plant NDA instrumentation, 9:2055 (BA;XA)
**Nondestructive Analysis**
IAEA experience with authentication of in-plant NDA instrumentation, 9:2055 (BA;XA)
**I-BEAM TYPE REACTORS**
**Design**
Westinghouse ICF power plant design, 9:4208 (BA;XA)
**ICE**
**Coverings**
Test results of Thermal Ice Cap prototype and final comments. Final report, 9:2639 (R;US)
**Thermal Insulation**
Test results of Thermal Ice Cap prototype and final comments. Final report, 9:2639 (R;US)
**ICE CONDENSERS**
Hydrogen mixing in compartments with a high-velocity source, 9:2409 (R;US)
**Stress Analysis**
Ice-condenser containment loadings during severe accidents (PWR; BWR), 9:2445 (R;US)
**ICR HEATING**
Nonlinear magnetohydrodynamic. Summary of recent activity (Task I). Progress report, 9:4047 (R;US)
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Computerized Simulation**
Theory and simulation of RF heating and current drive, 9:4133 (BA;XA)
**Monte Carlo Method**
Monte Carlo studies of tandem-mirror plasmas interacting with waves in the ion-cyclotron range of frequencies (ICRF). Annual report, October 1, 1982-September 30, 1983, 9:4042 (R;US)
**IDAHO NATIONAL ENGINEERING LABORATORY**
*Prior to 1976 known as NRTS and older material is so indexed.*
**Antelopes**
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3279 (RA;US)
**Baseline Ecology**
Baseline vegetation data for a controlled burn site, 9:3278 (RA;US)
Effects of prescribed burning on nongame birds breeding in sagebrush communities - pre-burn phase, 9:3307 (RA;US)
Evaluating the effects of a prescribed burn on the foraging ecology of sage and Brewer's sparrows, 9:3306 (RA;US)
Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report, 9:3288 (R;US)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Birds**
Dispersal and harvest of sage grouse utilizing the test reactor area on the Idaho National Engineering Laboratory, 9:3342 (RA;US)
Ecological study of the American rough-legged hawk on the Idaho National Engineering Laboratory, 9:3317 (RA;US)
Raptor electrocutions on the Idaho National Engineering Laboratory (Aquila chrysaetos, Buteo lagopus, Buteo jamaicensis, Bubo virginianus, Falco sparverius, Falco mexicanus, Buteo regalis), 9:3426 (RA;US)

Raptor studies on the Idaho National Engineering Laboratory (Asio otus, Aquila chrysaetos, Haliaeetus leucocephalus), 9:3318 (RA;US)
Sage grouse census methods and populations in southeastern Idaho, 9:3341 (RA;US)
Sage grouse on the Idaho National Environmental Research Park, 9:3319 (RA;US)
**Fossils**
Late-Pleistocene vegetation history of the Idaho National Engineering Laboratory, 9:3427 (RA;US)
**Grass**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
**Insects**
Insects associated with sagebrush communities at the Idaho National Engineering Laboratory, 9:3310 (RA;US)
**Plants**
Idaho National Engineering Laboratory vegetation data file, 9:3303 (RA;US)
Late-Pleistocene vegetation history of the Idaho National Engineering Laboratory, 9:3427 (RA;US)
Survey and assessment of the rare vascular plants of the Idaho National Engineering Laboratory, 9:3301 (RA;US)
**Rabbits**
Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3315 (RA;US)
Relationships of black-tailed jack rabbit diets to vegetal composition of habitats, 9:3312 (RA;US)
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3279 (RA;US)
**Radioactive Waste Facilities**
Iodine-129 in muscle of waterfowl using the test reactor area radioactive leaching ponds in southeastern Idaho, 9:3328 (RA;US)
Small mammal density and movement on the SL-1 disposal area, Idaho National Engineering Laboratory, 9:3291 (RA;US)
**Research Programs**
Idaho National Engineering Laboratory radioecology and ecology programs. 1983 progress report, 9:3288 (R;US)
**Rodents**
Long-term studies of relative density of rodents on the Idaho National Engineering Laboratory, 9:3316 (RA;US)
**Shrubs**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
Sagebrush distributions on the Idaho National Engineering Laboratory, 9:3304 (RA;US)
**Soils**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
**Wild Animals**
Coyote-leporid relations on the Idaho National Engineering Laboratory (Canis latrans, Lepus californicus), 9:3313 (RA;US)
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)

**IDEAL FLOW**
**Conformal Mapping**
Rayleigh—Taylor instability and the use of conformal maps for ideal fluid flow, 9:3607 (J;US)
**Rayleigh-Taylor Instability**
Rayleigh—Taylor instability and the use of conformal maps for ideal fluid flow, 9:3607 (J;US)

**IDENTIFICATION SYSTEMS**
**Standards**
American National Standard: fuel-assembly identification, 9:2213 (B;US)

**IEA**
*See INTERNATIONAL ENERGY AGENCY*

**IEAR-1 REACTOR**
**Fuel Scanning**
Non destructive burn up determination of IEA-R1 reactor fuel elements by gamma-ray spectrometry using a Ge(Li) detector, 9:2395 (B;BR;In Portuguese)
**Reliability**
Calculation of the probability to occur accidents at IEA-R1 reactor, 9:2396 (B;BR;In Portuguese)

**IGT WASTE PROCESS**
*See BIOGAS PROCESS*

**IMAGE INTENSIFIERS**
**Design**
Edge and line enhancement by adaptive lattice filtering, 9:3220 (J;US)

**IMAGE PROCESSING**
**Real Time Systems**
Design logic and modelling of RASTR special processor for C-detector of ARES spectrometer, 9:3181 (R;SU;In Russian)
RASTR special processor design, 9:3180 (R;SU;In Russian)

**IMAGE SCANNERS**
**Delay Circuits**
Report on the potential application of the artificial delay line technique as an ultra high precision electronic readout system for channel plate X-ray imaging detectors, 9:3191 (R;GB)
**Resolution**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Sensitivity**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)

**IMAGES**
**Fourier Transformation**
Binary multiplexing and the phase-retrieval problem, 9:4028 (J;US)

**IMMOBILIZATION**
*See VITRIFICATION*

**IMPLANTED SOURCES**
*See RADIATION SOURCE IMPLANTS*

**IMPORTS**
**Environmental Impacts**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)

**IMPURITIES**
*Unwanted constituents, not for TRACE AMOUNTS, INTERFERING ELEMENTS, or metal and nonmetal additions.*
**Transport Theory**
Viscosity-driven impurity transport in a stellarator, 9:4085 (J;US)

**INCINERATION**
*See COMBUSTION*

**INCINERATORS**
*See also WATERWALL INCINERATORS*
**Specifications**
Design and operational experience with the off-gas cleaning system of the Seibersdorf incinerator plant, 9:1953 (RA;XA)
**Testing**
High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium, 9:1949 (R;XE)

**INCLUSION COMPLEXES**
*See CLATHRATES*

**INCLUSIVE DISTRIBUTION**
*See INCLUSIVE INTERACTIONS*

**INCLUSIVE INTERACTIONS**
**Factorization**
Factorization and other novel effects in QCD, 9:3772 (R;US)

**INCONEL 600**
**Stress Corrosion**
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water, 9:2215 (R;US)

**IN-CORE FUEL MANAGEMENT**
*See FUEL MANAGEMENT*

**INDIA**
**Nuclear Power Plants**
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)

**Reactor Technology**
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)

**INDIUM**
**Electric Conductivity**
Oxidation effects on the electric resistance of In and Al in thin layers, 9:2693 (RA;BR;In Spanish)

**INDIUM ALLOYS**
**Uses**
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3209 (R;US)

**INDIUM ARSENIDES**
**Backscattering**
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Electron Mobility**
Electron mobilities in In/sub 0.2/Ga/sub 0.8/As/GaAs strained-layer superlattices, 9:2839 (J;US)
**Ion Channeling**
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
Ion dechanneling due to lattice strains in semiconductor superlattices, 9:2852 (J;US)
Strain measurements by channeling angular scans, 9:2830 (J;US)
**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Strains**
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
Strain measurements by channeling angular scans, 9:2830 (J;US)
**Uses**
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3209 (R;US)

**INDIUM COMPLEXES**
**Chemical Bonds**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)
**Perturbed Angular Correlation**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)

**INDIUM OXIDES**
**Electrical Properties**
Weak localization in indium oxide films, 9:2790 (J;NL)

**INDIUM PHOSPHATES**
**Energy Gap**
Estimation of the band gap of $InPO_4$, 9:2862 (J;US)

**INDIUM PHOSPHIDES**
**Charge Density**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Chemical Bonds**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Electron Diffraction**
Structure-factor phase information from two-beam electron diffraction, 9:2858 (J;US)
**Lattice Parameters**
Structural origin of optical bowing in semiconductor alloys p, 9:2859 (J;US)
**Optical Dispersion**
Dispersion of the refractive index of InP and ZnTe, 9:2864 (J;US)
**Refractivity**
Dispersion of the refractive index of InP and ZnTe, 9:2864 (J;US)
**Structure Factors**
Structure-factor phase information from two-beam electron diffraction, 9:2858 (J;US)

**INDOLES**
**Electron Transfer**
Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3003 (J;US)
**Excitation**
Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3003 (J;US)
**Reduction**
Photoreduction of thioindigo: photoinitiated two-electron transfer within a substrate-quencher pair, 9:3003 (J;US)

**INDUSTRIAL PLANTS**
*See also COAL GASIFICATION PLANTS*
*COAL LIQUEFACTION PLANTS*
*COAL PREPARATION PLANTS*
*ETHANOL PLANTS*
*METHANOL PLANTS*
*OIL SAND PROCESSING PLANTS*
*OIL SHALE PROCESSING PLANTS*
*PETROLEUM REFINERIES*
*WASTE PROCESSING PLANTS*
**Dual-Purpose Power Plants**
On-site fuel-cell resource conservation in industrial-process applications. Final report, 9:2585 (R;US)
**Fuel Cell Power Plants**
On-site fuel-cell resource conservation in industrial-process applications. Final report, 9:2585 (R;US)

**INDUSTRIAL SECTOR**
*See INDUSTRY*

**INDUSTRIAL WASTES**
*See also WHEY*
**Anaerobic Digestion**
Amount of biogas and its availability for use in Finland, 9:2108 (R;FI;In Finnish)
**Combustion**
Direct combustion of industrial dry, composite waste in suspension. Final report, 9:2642 (R;US)

**INDUSTRY**
*See also AGRICULTURE*
*CEMENT INDUSTRY*
*COAL INDUSTRY*
*CONSTRUCTION INDUSTRY*
*METAL INDUSTRY*
*NATURAL GAS INDUSTRY*
*NUCLEAR INDUSTRY*
*PETROLEUM INDUSTRY*
*WOOD PRODUCTS INDUSTRY*
**Boiler Fuels**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2107 (R;FI;In Finnish)
**Coordinated Research Programs**
Development and organization of the industry/NRC procedures guide, 9:2487 (BA;US)
**Energy Analysis**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
**Fires**
Fire in targeting urban/industrial areas, 9:3243 (RA;US)
**Fuel Consumption**
After energy price decontrol: The role of government conservation programs, 9:2557 (R;US)

**INERTIAL CONFINEMENT**
*A dynamic plasma confinement by inertial forces.*
**Implosions**
Inertial fusion research based on pulsed power, 9:4221 (BA;XA)
**Ion Beams**
Research progress in intense ion beam production for inertial confinement fusion at Cornell University, 9:4223 (BA;XA)
**Light Ions**
Inertial fusion research based on pulsed power, 9:4221 (BA;XA)
Light-ion inertial confinement fusion research at Naval Research Laboratory, 9:4222 (BA;XA)

**INFRARED RADIATION**
**Detection**
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3209 (R;US)

**INFRARED SPECTRA**
**Uses**
Infrared fluorescence: a versatile probe of state-selected chemical dynamics, 9:2958 (J;US)
**INFRARED THERMOGRAPHY**
**Standards**
Professionalism in commercial infrared sensing: an update, 9:2659 (R;US)
**Training**
Professionalism in commercial infrared sensing: an update, 9:2659 (R;US)
**INHALATION EXPOSURE CHAMBERS**
*See EXPOSURE CHAMBERS*
**INHOMOGENEOUS PLASMA**
**Emission Spectra**
Calculation of spectrum line emission from plasmas, 9:4036 (R;GB)
**Magnetohydrodynamics**
Finite-larmor-radius magnetohydrodynamic equations for microturbulence, 9:4100 (J;US)
**Parametric Instabilities**
Inhomogeneous two-plasmon instability, 9:4116 (J;US)
**Plasma Density**
Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid, 9:4109 (J;US)
**Rayleigh-Taylor Instability**
Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid, 9:4109 (J;US)
**Turbulence**
Finite-larmor-radius magnetohydrodynamic equations for microturbulence, 9:4100 (J;US)
**Wave Propagation**
Inhomogeneous two-plasmon instability, 9:4116 (J;US)
**INKS**
**Chemical Radiation Effects**
Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3027 (R;US)
**Photochemistry**
Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3027 (R;US)
**INORGANIC ACIDS**
*See also HYDROCHLORIC ACID*
*HYDROFLUORIC ACID*
*NITRIC ACID*
*PHOSPHORIC ACID*
*SILICIC ACID*
*SULFURIC ACID*
**Crystal Structure**
Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$, 9:2925 (J;US)
**Neutron Diffraction**
Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$, 9:2925 (J;US)
**INSECTS**
**Inventories**
Insects associated with sagebrush communities at the Idaho National Engineering Laboratory, 9:3310 (RA;US)
**IN-SITU GASIFICATION**
**Field Tests**
Fundamental investigations of underground coal gasification. Annual report Mar 82-Mar 83, 9:1771 (R;US)
**Mathematical Models**
Fundamental investigations of underground coal gasification. Annual report Mar 82-Mar 83, 9:1771 (R;US)
**INSTABILITY GROWTH RATES**
**Inhibition**
Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid, 9:4109 (J;US)
**INSTANTONS**
**Statistical Mechanics**
Questions of phase transition and coupling constant renormalization in the interacting instanton gas, 9:4007 (RA;SU)
**Supersymmetry**
Supersymmetry breaking by instantons, 9:3815 (J;US)
**Yang-Mills Theory**
Questions of phase transition and coupling constant renormalization in the interacting instanton gas, 9:4007 (RA;SU)
**INSTITUTO DE ENERGIA ATOMICA R1**
*See IEAR-1 REACTOR*
**INSTRUMENTS (MEASURING)**
*See MEASURING INSTRUMENTS*
**INSULATING LIMITERS**
*See LIMITERS*
**INSULATION (THERMAL)**
*See THERMAL INSULATION*
**INSULATORS (ELECTRICAL)**
*See ELECTRICAL INSULATORS*
**INSULIN**
**Labelling**
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3036 (R;DE;In German)
**INTEGRATED CIRCUITS**
**Fabrication**
Wafer-scale laser pantography: Fabrication of n-metal-oxide-semiconductor transistors and small-scale integrated circuits by direct-write laser-induced pyrolytic reactions, 9:3103 (J;US)
**INTENSIFIERS (IMAGE)**
*See IMAGE INTENSIFIERS*
**INTERACTING BOSON MODEL**
Predictions of the interacting boson approximation in a consistent Q framework, 9:3950 (J;US)
**INTERCALATES**
*See CLATHRATES*
**INTERCHANGE INSTABILITY**
*See FLUTE INSTABILITY*
**INTERFEROMETERS**
**Fabrication**
Scanning microwave interferometer for ELMO bumpy torus, 9:4098 (J;US)
**Streak Photography**
Optically recording interferometer for velocity measurements with subnanosecond resolution, 9:3216 (J;US)
**Uses**
Scanning microwave interferometer for ELMO bumpy torus, 9:4098 (J;US)
**INTERMEDIATE MASS NUCLEI**
*For nuclei with mass 41-180.*
*See also BARIUM 140*
*BARIUM 147*
*BARIUM 148*
*BROMINE 82*
*CALCIUM 48*
*CESIUM 146*
*CHROMIUM 51*
*COBALT 58*
*COBALT 60*
*GERMANIUM 67*
*HAFNIUM 164*
*IODINE 125*
*IODINE 131*
*IRON 56*
*IRON 57*
*KRYPTON 84*
*KRYPTON 86*
*MANGANESE 54*
*NICKEL 62*
*NIOBIUM 95*
*RHODIUM 106*
*RUBIDIUM 95*
*RUBIDIUM 97*
*RUTHENIUM 106*
*SELENIUM 75*
*STRONTIUM 90*
*STRONTIUM 99*
*TIN 118*
*TITANIUM 44*
*YTTRIUM 101*
*YTTRIUM 99*
*ZINC 65*
*ZIRCONIUM 101*
*ZIRCONIUM 90*
*ZIRCONIUM 95*
**Kaon Minus Reactions**
Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Kaon Plus Reactions**
Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)

**INTERMEDIATE VECTOR BOSONS**
**Particle Decay**
Limits to the number of neutrinos: A comment on the Z° discovery, 9:3781 (J;US)
Nondiagonal Z-decay - Z→anti e+μ, 9:3808 (RA;HU)
**INTERNAL CONTAMINATION**
*See RADIONUCLIDE KINETICS*
**INTERNAL FRICTION**
**Measuring Methods**
Digitally controlled measurement of sonic elastic moduli and internal friction by phase analysis, 9:3213 (J;US)
**INTERNATIONAL ENERGY AGENCY**
Information on the operation of the International Energy Agency's Coal Industry Advisory Board, 9:2555 (R;US)
**INTERNATIONAL LAWS**
**Work**
Thirty-first to thirty-third annual report on the work of the Institut fuer Voelkerrecht at the Universitaet Goettingen. 1 April 1979 to 31 December 1981, 9:4270 (B;DE;In German)
**INTERNATIONAL TOKAMAK REACTOR**
*See INTOR TOKAMAK*
**INTERSTELLAR MAGNETIC FIELDS**
**Stellar Radiation**
Pair production and annihilation in strong magnetic fields, 9:3459 (R;US)
**INTERSTELLAR SPACE**
**Plasma**
Paradigm transition in cosmic plasma physics, 9:3468 (R;SE)
**INTESTINES**
*See also LARGE INTESTINE*
**Radionuclide Kinetics**
The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3397 (J;US)
**INTOR TOKAMAK**
*International Tokamak Reactor.*
**Divertors**
Predicted behaviour of the single-null divertor of INTOR, 9:4142 (R;GB)
**Heat Transfer**
Ripple transport in INTOR, 9:4143 (R;GB)
**ICR Heating**
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Limiters**
Predicted behaviour of the pumped limiter of INTOR, 9:4145 (R;GB)
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Magnet Coils**
Numerical simulation of the operation regimes of the poloidal field system of a tokamak reactor, 9:4180 (R;SU;In Russian)
**Magnetic Field Ripples**
Ripple transport in INTOR, 9:4143 (R;GB)
**Mechanical Structures**
Engineering aspects of the INTOR design, 9:4200 (BA;XA)
**Reactor Maintenance**
Engineering aspects of the INTOR design, 9:4200 (BA;XA)
**Temperature Control**
Ripple transport in INTOR, 9:4143 (R;GB)
**INVERTEBRATES**
*See also MOLLUSCS*
**Biological Effects**
Nutrient spiralling in streams: implications for nutrient limitation and invertebrate activity, 9:3324 (J;US)
**Taxonomy**
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3336 (R;US)
**INVISCID FLOW**
*See IDEAL FLOW*
**IODINE**
**Absorption Spectra**
Complex time dependent wave packet technique for thermal equilibrium systems: Electronic spectra, 9:3547 (J;US)
**Electronic Structure**
Complex time dependent wave packet technique for thermal equilibrium systems: Electronic spectra, 9:3547 (J;US)
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Visible Spectra**
Complex time dependent wave packet technique for thermal equilibrium systems: Electronic spectra, 9:3547 (J;US)
**IODINE 125**
**Radiation Monitoring**
Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment, 9:3169 (RA;XA)
**IODINE 131**
**Evaporation**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
**Filtration**
Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation, 9:2201 (RA;XA)
Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system, 9:2203 (RA;XA;In French)
**Radiation Monitoring**
Apparatus for determining radiation hazards from inhaled airborne radioiodine in a radioisotope production establishment, 9:3169 (RA;XA)
**Radiochemistry**
Regiospecific incorporation of radioiodine into aromatic rings via organosilanes, 9:3042 (J;GB)
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**IODINE IODIDES**
*See IODINE*
**IODINE ISOTOPES**
*See also IODINE 125*
*IODINE 131*
**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)
**ION BEAM TYPE REACTORS**
*See I-BEAM TYPE REACTORS*
**ION BEAMS**
*See also DEUTERON BEAMS*
**Beam Production**
Research progress in intense ion beam production for inertial confinement fusion at Cornell University, 9:4223 (BA;XA)
**ION BLOCKING**
*See ION CHANNELING*
**ION CHANNELING**
**Stopping Power**
Position-dependent stopping power for channeled ions, 9:3967 (J;US)
**Uses**
Ion channeling techniques for defect and surface studies, 9:3971 (BA;NL)
**ION CLUSTERS**
*See ION PAIRS*
**ION COLLISIONS**
*See also ION-MOLECULE COLLISIONS*
**Auger Effect**
Generation of vibrationally excited $H_2$ molecules by $H_3^+$ wall collisions, 9:3540 (R;US)
**Charge Exchange**
Generation of vibrationally excited $H_2$ molecules by $H_3^+$ wall collisions, 9:3540 (R;US)
**ION CYCLOTRON RESONANCE SPECTROSCOPY**
**Electrical Equipment**
Ion cyclotron resonance bridge detector for frequency sweep, 9:3211 (J;US)

**ION CYCLOTRON-RESONANCE HEATING**
*See ICR HEATING*
**ION EXCHANGE**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)
**ION EXCHANGE MEMBRANES**
*See MEMBRANES*
**ION IMPLANTATION**
**Physical Radiation Effects**
Radiation-enhanced diffusion in ion-implanted glasses and glass/metal couples, 9:3965 (R;US)
**ION PAIRS**
**Research Programs**
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3258 (R;US)
**ION SOURCES**
Production of negative $D^-$ ions by double charge exchange using cesium, 9:4225 (TG;US)
**Beam Optics**
Comparison of the ionooptical parameters of one- and two-stage accelerator systems, 9:3144 (R;SU;In Russian)
**Comparative Evaluations**
Comparison of the ionooptical parameters of one- and two-stage accelerator systems, 9:3144 (R;SU;In Russian)
**Design**
High-intensity lithium-ion source, 9:3153 (J;US)
Single-ring magnetic cusp ion source, 9:3551 (J;US)
**Fabrication**
High-intensity lithium-ion source, 9:3153 (J;US)
Single-ring magnetic cusp ion source, 9:3551 (J;US)
**Operation**
High-intensity lithium-ion source, 9:3153 (J;US)
**Sputtering**
Theoretical considerations associated with the production of negative ions in sputter-type ion sources, 9:3572 (J;US)
**ION-DRAG ACCELERATORS**
*See ELECTRON-RING ACCELERATORS*
**IONIC CONDUCTIVITY**
**Probabilistic Estimation**
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)
**IONIC REACTIONS**
*See IONS*
**IONIZATION**
**Computer Codes**
Computer code realization for a mathematical model of ionization front forming process at injection of relativistic electron beam into a gas chamber, 9:3530 (R;SU;In Russian)
**IONIZATION CALORIMETERS**
*See SHOWER COUNTERS*
**ION-MOLECULE COLLISIONS**
**Charge Exchange**
First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles, 9:3555 (J;US)
**Ion Emission**
First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles, 9:3555 (J;US)
**Research Programs**
Negative-ion detachment cross sections. Progress report, March 1, 1983-February 28, 1984, 9:3510 (R;US)
**IONS**
*Ions in solutions are indexed as compounds; ions in gases by the precoordinated descriptor consisting of the element name and the term ions; ions in beams by assigning either the specific name if available, e.g. ARGON 40 BEAMS*
*See also ANIONS*
*ARGON IONS*
*ARSENIC IONS*
*BARIUM IONS*
*BERYLLIUM IONS*
*BROMINE IONS*
*CARBON IONS*
*CATIONS*
*CESIUM IONS*
*COPPER IONS*
*DEUTERIUM IONS*
*DYSPROSIUM IONS*
*ERBIUM IONS*
*GADOLINIUM IONS*
*GALLIUM IONS*
*GERMANIUM IONS*
*HEAVY IONS*
*HELIUM IONS*
*HYDROGEN IONS*
*IRON IONS*
*KRYPTON IONS*
*LANTHANUM IONS*
*LITHIUM IONS*
*MOLYBDENUM IONS*
*NEODYMIUM IONS*
*NEON IONS*
*NICKEL IONS*
*NIOBIUM IONS*
*NITROGEN IONS*
*OXYGEN IONS*
*RUBIDIUM IONS*
*SAMARIUM IONS*
*SELENIUM IONS*
*SILICON IONS*
*STRONTIUM IONS*
*TRITIUM IONS*
*YTTERBIUM IONS*
*YTTRIUM IONS*
*ZINC IONS*
*ZIRCONIUM IONS*
**Collisions**
Desorption by ions and electrons, 9:4170 (RA;JP;In Japanese)
**IRIDIUM**
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Physical Radiation Effects**
Low temperature irradiations of iridium and of the compound $Nb_3Ge$ (Neutron irradiation), 9:2672 (R;FR;In French)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**IRIDIUM BASE ALLOYS**
**Impact Strength**
Effect of thorium additions on metallurgical and mechanical properties of Ir-0.3 pct W alloys, 9:2752 (J;US)
**Mechanical Properties**
Effect of thorium additions on metallurgical and mechanical properties of Ir-0.3 pct W alloys, 9:2752 (J;US)
**Metallurgy**
Effect of thorium additions on metallurgical and mechanical properties of Ir-0.3 pct W alloys, 9:2752 (J;US)
**IRIDIUM COMPOUNDS**
**Chemical Preparation**
Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls, 9:2918 (J;US)
**IRON**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Catalytic Effects**
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Chemical Reactions**
Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation, 9:2922 (J;US)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Hydrogen Embrittlement**
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6.

technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2701 (R;DE;In German)
**Magnetic Moments**
Internal magnetic fields in hcp-iron, 9:2739 (J;US)
**Paramagnetism**
Internal magnetic fields in hcp-iron, 9:2739 (J;US)
**Permeability**
Diffusion assisted by radiation as a surface protection method, 9:2694 (RA;BR;In Portuguese)
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2701 (R;DE;In German)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Sorptive Properties**
Decomposition of water adsorbed in iron and nickel films, 9:2692 (RA;BR;In Spanish)
**Surface Properties**
Diffusion assisted by radiation as a surface protection method, 9:2694 (RA;BR;In Portuguese)
**IRON 54 TARGET**
**Kaon Plus Reactions**
Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3886 (RA;US)
**IRON 56**
**OPE Potential**
Calculations of pion excess in nuclei, 9:3952 (J;US)
**IRON 56 REACTIONS**
**Fragmentation**
Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon, 9:3891 (J;US)
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**IRON 56 TARGET**
**Iron 56 Reactions**
Charge and mass exchange in $^{56}$Fe-induced reactions at 8.3 MeV/nucleon, 9:3891 (J;US)
**IRON 57**
**Moessbauer Effect**
First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$, 9:2782 (J;US)
Metastable phase separation in Au-Fe alloys, 9:2714 (J;US)
**Nuclear Quadrupole Resonance**
Closed-loop phase diagrams, vaporization, and multicriticality in binary liquid mixtures, 9:2853 (J;US)
**IRON 57 TARGET**
**Neutron Reactions**
Neutron-induced gamma-ray production in $^{57}$Fe for incident neutron energies between 0.16 and 21 MeV, 9:3892 (J;US)
**IRON ALLOYS**
*See also INCONEL 600*
*IRON BASE ALLOYS*
**Crack Propagation**
Quantitative fractography and dislocation interpretations of the cyclic cleavage crack growth process, 9:2730 (J;US)
**Fractography**
Quantitative fractography and dislocation interpretations of the cyclic cleavage crack growth process, 9:2730 (J;US)
**Magnetic Moments**
Magnetic moment distribution in Fe/sub 0.68/ $^{60}$Ni/sub 0.32/, 9:2738 (J;US)
**Microstructure**
Rapid solidification microstructures in austenitic Fe-Ni alloys, 9:2727 (J;US)
**Oxidation**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)
**Phase Studies**
Metastable phase separation in Au-Fe alloys, 9:2714 (J;US)
**Physical Radiation Effects**
The role of environmental conditions in in-situ experiments in the high-voltage electron microscope, 9:3219 (J;DD)
**Solidification**
Rapid solidification microstructures in austenitic Fe-Ni alloys, 9:2727 (J;US)
**IRON BASE ALLOYS**
*See also CAST IRON*
*STEELS*
**Grain Boundaries**
Observation of the effect of solute segregation on grain boundary structure, 9:2676 (R;US)
**Magnetic Moments**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)
**Magnetization**
High magnetic moment in $Fe_{87}B_{11}Au_2$ ribbons, 9:2734 (J;US)
**Physical Radiation Effects**
Low temperature irradiation effects on iron-boron based amorphous metallic alloys (Electron irradiation), 9:2673 (R;FR;In French)
**Radioactivation**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)
**IRON COMPLEXES**
**Adsorption**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Chemical Reaction Yield**
Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation, 9:2922 (J;US)
**Excitation**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
Lifetimes of the ligand-to-metal charge-transfer excited states of iron(III) and osmium(III) polypyridine complexes. Effects of isotopic substitution and temperature, 9:2919 (J;US)
**Moessbauer Effect**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)
**Molecular Structure**
An x-ray absorption study of the binuclear iron center in deoxyhemerythrin, 9:2940 (J;US)
Structure of the binuclear iron center in hemerythrin by X-ray absorption spectroscopy, 9:2964 (J;US)
**PH Value**
Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2955 (J;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)
**Raman Spectra**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**Structural Chemical Analysis**
Iron and molybdenum extended X-ray absorption fine structure studies of double-cubane clusters containing $MoFe_3S_4$ cores, 9:2936 (J;US)
**Voltametry**
In situ laser Raman spectra of iron phthalocyanine adsorbed on copper and gold electrodes, 9:2933 (J;US)
**X-Ray Spectroscopy**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)
**IRON COMPOUNDS**
*See also IRON OXIDES*
*IRON SILICIDES*
**Catalytic Effects**
Moessbauer spectroscopic and related characterization of Fischer-Tropsch catalysts. Final report, 9:2070 (R;US)
**Electron Exchange**
Ab initio study of electronic coupling in the aqueous $Fe^{2+}$—$Fe^{3+}$ electron exchange process, 9:2951 (J;US)

**IRON IONS**
**Ion-Atom Collisions**
Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules, 9:3563 (J;US)
**Ion-Molecule Collisions**
Electron capture by slow Fe/sup q/+ ions from hydrogen atoms and molecules, 9:3563 (J;US)
**IRON OXIDES**
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
**Crystal Field**
Closed-loop phase diagrams, vaporization, and multicriticality in binary liquid mixtures, 9:2853 (J;US)
**Electronic Structure**
First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$, 9:2782 (J;US)
**Ionic Conductivity**
Analysis of the stoichiometry and temperature dependence of cation diffusion in wustite, Fe/sub 1-delta/O, 9:2778 (J;US)
**Nuclear Quadrupole Resonance**
First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$, 9:2782 (J;US)
**Reduction**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)
**Shielding**
First-principles theory of antishielding effects in the nuclear quadrupole interaction in ionic crystals: Application to /sup 57m/Fe in $Fe_2O_3$, 9:2782 (J;US)
**Stoichiometry**
Analysis of the stoichiometry and temperature dependence of cation diffusion in wustite, Fe/sub 1-delta/O, 9:2778 (J;US)
**IRON SILICIDES**
**Magnetic Properties**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**Specific Heat**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**Spin Waves**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**IRRADIATION DEVICES**
**Licensing**
Radiation Safety Act 1975 - No. 44 of 1975, 9:4260 (R;AU)
Radiation (Safety Control) Ordinance 1978, 9:4261 (R;AU)
**IRRADIATION PLANTS**
**Gamma Sources**
Cesium-137 gamma-source considerations for dry-sludge irradiators, 9:2066 (R;US)
**IRRADIATION PROCEDURES**
**Planning**
Physical investigation on the postoperative chest wall irradiation with tangential cobalt moving beam, 9:3366 (RA;HU;In Hungarian, English)
**IRRADIATION RIGS**
*See IRRADIATION DEVICES*
**IRRIGATION**
**Photovoltaic Power Supplies**
Experimentation of micro-irrigation by solar pumping: 1979-1981. Final report, 9:2132 (R;XE;FR)
**ISING MODEL**
**Surface Tension**
Surface tension calculation of the Ising model in square lattice using the renormalization group, 9:3519 (RA;BR;In Portuguese)
**ISOTOPE DATING**
**Specifications**
Argon analytical procedures for potassium-argon dating, 9:3428 (R;NZ)
**ISOTOPE EFFECTS**
**Research Programs**
Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2971 (R;US)
**ISOTOPE ENRICHED MATERIALS**
**Availability**
Availability of enriched isotopic material for accelerator targets, 9:2062 (J;US)
**ISOTOPE ENRICHMENT**
*See ISOTOPE SEPARATION*
**ISOTOPE PRODUCTION**
**Planning**
Radioisotope production (LAMPF II), 9:3149 (RA;US)
**ISOTOPE SEPARATION**
*For separation of isotopes of the same element only.*
*See also LASER ISOTOPE SEPARATION*
**Electrophoresis**
Process for isotope separation, 9:1918 (TG;US)
**ISOTOPIC EFFECTS**
*See ISOTOPE EFFECTS*
**ISOTOPIC SEPARATION**
*See ISOTOPE SEPARATION*
**ISX TOKAMAK**
**ECR Heating**
Preionization and start-up in the ISX-B tokamak using electron cyclotron heating at 28 GHz, 9:4073 (R;US)
**Reactor Fueling**
Performance characterization of pneumatic single pellet injection system, 9:4146 (R;US)
**ITALY**
**Geothermal Fields**
Community demonstration project: geothermal pair of wells at Latera. Final drilling report, 9:2157 (R;XE;In English and Italian)
**Radioactive Materials**
Decree of 25 September 1982 amending Ministerial Decree of 27 July 1966 on conditions for notifying possession of radioactive materials and for annual updating of records thereof, 9:2054 (R;IT;In Italian)
**Safety Standards**
Decree No. 524 of 8 June 1982 of the President of the Republic implementing CEC. Directive No. 77/576 for standardization of Member States' legislative, regulatory and administrative provisions on safety signs in workplaces and CEC Directive No. 79/640 amending the Annexes of the latter, 9:4265 (R;IT;In Italian)
**ITERATIVE METHODS**
Optimal parameters for linear second-degree stationary iterative methods, 9:4250 (J;US)

## J

**J-3105 RESONANCES**
*See PSI-3105 RESONANCES*
**JAILS**
*See PUBLIC BUILDINGS*
**JAPAN**
**Energy Policy**
Historical overview of US coal exports, 1973-1982, 9:1809 (R;US)
**PWR Type Reactors**
Quality assurance activities of PWR plants in Japan, 9:2234 (J;US)
**JAPAN ATR FUGEN**
*See JATR REACTOR*
**JAPAN FAST EXPERIMENTAL BREEDER REACTOR**
*See JOYO REACTOR*
**JAPAN RESEARCH REACTOR-2**
*See JRR-2 REACTOR*
**JAPAN RESEARCH REACTOR-3**
*See JRR-3 REACTOR*
**JAPAN RESEARCH REACTOR-4**
*See JRR-4 REACTOR*
**JATR REACTOR**
**Performance**
Role of Fugen HWR in Japan and design of a 600 MWe demonstration reactor, 9:2269 (R;JP)

**JEN-1 REACTOR**
**Fuel Elements**
Core optimization studies at JEN - Spain, 9:2373 (RA;US)
**JET ENGINE FUELS**
**Fuel Additives**
The use of fuel additives to control plume opacity of turbine engine test cells. Final report Mar 78-Oct 81, 9:1862 (R;US)
**JFER REACTOR**
*See JOYO REACTOR*
**JINR CYCLOTRONS**
**Specifications**
Cyclotron facility for acceleration of heavy ions to 20-120 MeV/nucleon, 9:3120 (R;SU;In Russian)
**JIPPT-2 DEVICE**
**Beam Injection Heating**
Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4064 (R;JP)
**ECR Heating**
Electron cyclotron heating of stellarator plasma with the ordinary and the extraordinary modes in JIPP T-II, 9:4058 (R;JP)
**High-Frequency Heating**
Experiment on heating with simultaneous injection of neutral-beam and lower hybrid waves in the JIPP T-II torus, 9:4064 (R;JP)
**JOYO REACTOR**
**Power Coefficient**
Power coefficient anomaly in Joyo, (2). Presumption about the causing mechanism, 9:2389 (R;JP;In Japanese)
**JRR-2 REACTOR**
**Radioactive Effluents**
Experiences in radioactive gaseous effluent management in JAERI, 9:2379 (RA;XA)
**Reactor Operation**
Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980, 9:2384 (R;JP;In Japanese)
**JRR-3 REACTOR**
**Reactor Operation**
Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980, 9:2384 (R;JP;In Japanese)
**JRR-4 REACTOR**
**Reactor Operation**
Report on operation, utilization and technical development of research reactors and hot laboratory. April 1, 1979 to March 31, 1980, 9:2384 (R;JP;In Japanese)
**JUNCTIONS (SEMICONDUCTOR)**
*See SEMICONDUCTOR JUNCTIONS*

## K

**K REACTOR**
**Thermal Pollution**
Thermal-effects study, 9:2342 (R;US)
**K01**
*See KAONS NEUTRAL SHORT-LIVED*
**K02**
*See KAONS NEUTRAL LONG-LIVED*
**KALKAR POWER REACTOR**
*See SNR-1 REACTOR*
**KANGAROO RAT**
*See RODENTS*
**KAON MINUS REACTIONS**
**Absorption**
Measurement of two-nucleon absorption rates in $K^-$ absorption at rest, 9:3650 (RA;US)
Singles and coincidence $\gamma$-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Capture**
Radiative kaon capture, 9:3635 (RA;US)
**Multiple Scattering**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}O$ and $^{18}O$ at 800 MeV, 9:3871 (RA;US)
**Scattering**
Singles and coincidence $\gamma$-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Strangeness-Exchange Reactions**
How to populate bound hypernuclear levels, 9:3644 (RA;US)
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Possible investigations of the $(K^-, K^+)$ reaction, 9:3642 (RA;US)
Studies of narrow $\Sigma$-hypernuclear structure, 9:3643 (RA;US)
**KAON MINUS-DEUTERON INTERACTIONS**
*See KAON-DEUTERON INTERACTIONS*
**KAON MINUS-PROTON INTERACTIONS**
**Capture**
$K^-$ and $\Sigma^-$ atoms and $p(K^-,\gamma)$, 9:3646 (RA;US)
Radiative kaon capture, 9:3635 (RA;US)
**Experiment Planning**
Low-energy $K^-p$ interactions, 9:3671 (RA;US)
**Particle Production**
Existence of $\Xi$ resonances above 2 GeV, 9:3721 (J;US)
**KAON NEUTRAL-DEUTERON INTERACTIONS**
*See KAON-DEUTERON INTERACTIONS*
**KAON PLUS REACTIONS**
**Absorption**
Singles and coincidence $\gamma$-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Elastic Scattering**
Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3886 (RA;US)
**Inelastic Scattering**
Conventional nuclear physics at LAMPF II: $K^+$-nucleus elastic and inelastic scattering, 9:3886 (RA;US)
**Knock-Out Reactions**
Search for $K^+$-nucleus states with positive strangeness by the $(K^+,p)$ knockout reaction, 9:3903 (RA;US)
**Multiple Scattering**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}O$ and $^{18}O$ at 800 MeV, 9:3871 (RA;US)
**Scattering**
Singles and coincidence $\gamma$-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**KAON PLUS-DEUTERON INTERACTIONS**
*See KAON-DEUTERON INTERACTIONS*
**KAON PLUS-PROTON INTERACTIONS**
**Elastic Scattering**
Spin-rotation parameter in $K^+$-p elastic scattering near 1.5 GeV/c, 9:3669 (RA;US)
**Multiple Production**
Energy and quantum number fluxes in $K^+p$ and $\pi^+p$ interactions at 32 and 70 GeV/c, 9:3623 (R;SU;In Russian)
**Spin Exchange**
Spin-rotation parameter in $K^+$-p elastic scattering near 1.5 GeV/c, 9:3669 (RA;US)
**KAON REACTIONS**
*See also KAON MINUS REACTIONS*
*KAON PLUS REACTIONS*
**Elastic Scattering**
Nuclear structure and nuclear reactions, 9:3902 (RA;US)
**Experiment Planning**
Activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei, 9:3874 (RA;US)
New scientific information from LAMPF II, 9:3906 (RA;US)
**Fragmentation**
Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles, 9:3922 (RA;US)
**Inelastic Scattering**
Nuclear structure and nuclear reactions, 9:3902 (RA;US)
**Strangeness-Exchange Reactions**
Hypernuclei, 9:3636 (RA;US)
**KAON-DEUTERON INTERACTIONS**
**Experiment Planning**
Spectroscopy of strange dibaryons with $K^-d \rightarrow Ap\pi^-$ reaction, 9:3660 (RA;US)

**KAONIC ATOMS**
**X-Ray Spectra**
$K^-$ and $\Sigma^-$ atoms and p($K^-$,γ), 9:3646 (RA;US)
Studies of the E2 nuclear resonance effect in kaonic atoms, 9:3649 (RA;US)
**KAON-NUCLEON INTERACTIONS**
**Elastic Scattering**
Elastic $K^+$ N scattering, 9:3670 (RA;US)
**KAONS**
*See also KAONS NEUTRAL*
*KAONS PLUS*
**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)
**Weak Particle Decay**
Kaon decays (LAMPF II experiment planning), 9:3685 (RA;US)
**KAONS 1**
*See KAONS NEUTRAL SHORT-LIVED*
**KAONS 2**
*See KAONS NEUTRAL LONG-LIVED*
**KAONS NEUTRAL**
*See also KAONS NEUTRAL LONG-LIVED*
*KAONS NEUTRAL SHORT-LIVED*
**Configuration Mixing**
Quark mixing angles in the left-right symmetric model with light W/sub R/ from $K^0$-$K^0$ mixing, 9:3803 (R;XA)
**Weak Particle Decay**
Considerations on a detector system for LAMPF II sensitive to $K^0$/sub L/ → μe at the $10^{-12}$ level, 9:3689 (RA;US)
CP symmetry in a high magnetic field, 9:3684 (RA;US)
Experiment to measure $eta_{000}$, 9:3682 (RA;US)
**KAONS NEUTRAL LONG-LIVED**
**Weak Particle Decay**
Consideration of a measurement of $(eta_{00})^2/(eta/sub +-/)^2$, 9:3681 (RA;US)
CP violation, 9:3813 (RA;US)
CP-violating polarization in K/sub μ3/⁺ and K/sub μ3/⁰ decays, 9:3680 (RA;US)
Determining the lifetime of the π/sup +-/μ/sup -+/ atom, 9:3698 (RA;US)
Experiment to measure the decay K/sub L/⁰ → $\pi^0 e^+ e^-$, 9:3679 (RA;US)
Experiment to measure the kaon beta decay rate (LAMPF II experiment planning), 9:3686 (RA;US)
**KAONS NEUTRAL SHORT-LIVED**
**Weak Particle Decay**
Consideration of a measurement of $(eta_{00})^2/(eta/sub +-/)^2$, 9:3681 (RA;US)
**KAONS PLUS**
**Bound State**
Search for $K^+$-nucleus states with positive strangeness by the ($K^+$,p) knockout reaction, 9:3903 (RA;US)
**Channeling**
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Weak Particle Decay**
CP-violating polarization in K/sub μ3/⁺ and K/sub μ3/⁰ decays, 9:3680 (RA;US)
Experiment to study the decay $K^+ \rightarrow \pi^+$ nu anti nu, 9:3690 (RA;US)
Search for exotics in two-body decay of $K^+$: K/sub $\mu_2$/ and K/sub $\pi_2$/ revisited, 9:3687 (RA;US)
Searching for $K^+ \rightarrow \pi^+ \mu^+ e^-$ (LAMPF II experiment planning), 9:3688 (RA;US)
**KAPITZA RESISTANCE**
**Interfaces**
Kapitza resistance theory, 9:3526 (RA;BR;In Portuguese)
**KARLSRUHE NUCLEAR RESEARCH CENTER**
*See KERNFORSCHUNGSZENTRUM KARLSRUHE*
**KARLSRUHE REPROCESSING PLANT**
*See WAK*
**KARLSRUHE RESEARCH REACTOR FR-2**
*See FR-2 REACTOR*
**KELP**
*See SEAWEEDS*
**KERNFORSCHUNGSZENTRUM KARLSRUHE**
**Radioactive Waste Disposal**
Waste management at the Karlsruhe Nuclear Research Center, 9:1981 (R;DE)
**Radioactive Waste Management**
Waste management at the Karlsruhe Nuclear Research Center, 9:1981 (R;DE)
**Radioactive Waste Processing**
Waste management at the Karlsruhe Nuclear Research Center, 9:1981 (R;DE)
**KETONES**
**Reduction**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983 (Fluorenone), 9:1766 (R;US)
**KICKER MAGNETS**
**Shielding**
SLAC beam scraper (and mask) for MK1 kicker magnet SPEAR 4S5 and 14S15 (Engineering Materials), 9:3160 (E;US)
**KIDNEY STONES**
*See URINARY TRACT*
**KIDNEYS**
**Dynamic Function Studies**
Significance of determination of the efficient renal plasma circulation and glomerular filtration in evaluation of early changes of kidney functional state during "non-complicated" skeletal trauma in children, 9:3375 (RA;SU;In Russian)
Significance of radioisotope and other investigational methods in definition of functional changes of different organs during some types of "non-complicated" skeletal trauma in children, 9:3376 (RA;SU;In Russian)
**Renography**
Significance of determination of the efficient renal plasma circulation and glomerular filtration in evaluation of early changes of kidney functional state during "non-complicated" skeletal trauma in children, 9:3375 (RA;SU;In Russian)
Significance of radioisotope and other investigational methods in definition of functional changes of different organs during some types of "non-complicated" skeletal trauma in children, 9:3376 (RA;SU;In Russian)
**KINETIC EQUATIONS**
*For reactor kinetics use REACTOR KINETICS EQUATIONS.*
**Analytical Solution**
Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982, 9:3970 (J;US)
**Green Function**
Construction of Green functions by the additive operator splitting method, 9:4000 (R;SU;In Russian)
**KLYSTRONS**
**Shielding**
SLAC 5045 klystron (Engineering Materials), 9:3119 (E;US)
**KNOCK-ON ELECTRONS**
*See ELECTRONS*
**KORTEWEG-DE VRIES EQUATION**
**Conservation Laws**
Generalized internal long wave equations: construction, hamiltonian structure and conservation laws, 9:4012 (R;SU)
**Hamiltonians**
Generalized internal long wave equations: construction, hamiltonian structure and conservation laws, 9:4012 (R;SU)
**KRYPTON**
**Adsorption**
Study of krypton and xenon solid monoshells adsorbed in graphite by transmission electron diffraction, 9:2818 (RA;BR;In Spanish)
**Photoionization**
Inner-valence shell photoionization of $Ar_3$, $Ar_3$, $Kr_3$, and $Kr_3$, 9:3548 (J;US)
**KRYPTON 84**
**Isotope Production**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)

**KRYPTON 86**
**Isotope Production**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**KRYPTON IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**KUCA REACTOR**
**Licensing**
Licensing procedures and safety criteria for core conversion in Japan, 9:2349 (RA;US)
**Reactor Safety Experiments**
KUCA critical experiment program using HEU and MEU fuel, 9:2370 (RA;US)
**KUHFR REACTOR**
**Coolants**
Flow test for the full scale core mockup of the KUHFR, (1). Velocity distribution and pressure loss in the core, 9:2385 (R;JP;In Japanese)
**Fuel Elements**
KUCA critical experiment program using HEU and MEU fuel, 9:2370 (RA;US)
**Reactor Cores**
Licensing procedures and safety criteria for core conversion in Japan, 9:2349 (RA;US)
**KUR REACTOR**
**Coordinated Research Programs**
Report of research by common utilization in Research Reactor Institute, Kyoto University, in first half of fiscal 1980, 9:2386 (R;JP;In Japanese)
**KYOTO UNIVERSITY CRITICAL ASSEMBLY REACTO**
*See KUCA REACTOR*
**KYOTO UNIVERSITY HIGH FLUX REACTOR**
*See KUHFR REACTOR*
**KYOTO UNIVERSITY REACTOR**
*See KUR REACTOR*

## L

**LABELLED COMPOUNDS**
*Compounds labelled with either stable or radioactive isotopes.*
*See also CARBON 14 COMPOUNDS*
*RADIOPHARMACEUTICALS*
*TRITIUM COMPOUNDS*
**Chemical Preparation**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, ,982-September 30, 1983, 9:3404 (R;US)
**LABORATORIES**
*See also HOT LABS*
**Automation**
State and problems of scientific research automation in radiation damage physics in KFTI, 9:2542 (RA;SU;In Russian)
**LACTOSE**
**Fermentation**
Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2128 (J;US)
**LAMBDA NEUTRAL**
*See LAMBDA PARTICLES*
**LAMBDA PARTICLES**
**Bound State**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
Search for strange dibaryons at KEK and LAMPF II, 9:3638 (RA;US)
**Energy-Level Transitions**
Electromagnetic decays of hyperon-excited states, 9:3769 (RA;US)
**Excited States**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
**Particle Production**
Measurement of two-nucleon absorption rates in $K^-$ absorption at rest, 9:3650 (RA;US)
**Weak Particle Decay**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
Measurement of CP violation in Λ decay, 9:3683 (RA;US)
Polarizion experiments with hyperons, 9:3694 (RA;US)
**LAMPF II SYNCHROTRON**
Executive summary (Physics justification), 9:3121 (RA;US)
**Accelerator Facilities**
Considerations on a detector system for LAMPF II sensitive to K⁰/sub L/ → μe at the $10^{-12}$ level, 9:3689 (RA;US)
Experiment to study the decay $K^+ \rightarrow \pi^+$ nu anti nu, 9:3690 (RA;US)
High-level radiation environment studies, 9:3150 (RA;US)
Physics with LAMPF II, 9:3634 (R;US)
Pion spectroscopy at LAMPF II: possibilities for EPICS II, 9:3146 (RA;US)
**Antinucleon Beams**
Search for mesons in the mass range 2.5 to 5 GeV/$c^2$, 9:3658 (RA;US)
Tagged antineutron experiments, 9:3655 (RA;US)
**Experiment Planning**
Antinucleon-nucleon physics, 9:3653 (RA;US)
Cosmologic studies at LAMPF II: the production of cosmogenic nuclides by energetic secondary particles, 9:3445 (RA;US)
Experiment to measure the decay K/sub L/$^0 \rightarrow \pi^0 e^+ e^-$, 9:3679 (RA;US)
New scientific information from LAMPF II, 9:3906 (RA;US)
Overview, 9:3145 (RA;US)
Physics with LAMPF II, 9:3634 (R;US)
Strong interactions: few hadron systems, 9:3652 (RA;US)
**Hyperon Beams**
XI⁰ experiments, 9:3693 (RA;US)
**Isotope Production**
Radioisotope production, 9:3149 (RA;US)
**Kaon Beams**
CP violation, 9:3813 (RA;US)
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Muon Beams**
Fundamental symmetries and interactions using muons, 9:3699 (RA;US)
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
Muon capture, 9:3700 (RA;US)
Muonium, 9:3533 (RA;US)
Rare muon decay, 9:3701 (RA;US)
Rare processes ($\mu^- + Z \rightarrow e^- + Z$ and $\mu^+ e^- \rightarrow \mu^- e^+$), 9:3702 (RA;US)
**Neutrino Beams**
Neutrino beams at LAMPF II, 9:3148 (RA;US)
Neutrino reactions, 9:3674 (RA;US)
Possible neutrino beams, fluxes, and rates at LAMPF II, 9:3147 (RA;US)
**Pion Beams**
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Storage Rings**
Muon storage ring for LAMPF II, 9:3161 (RA;US)
**LAND FILLS**
*See SANITARY LANDFILLS*
**LAND TRANSPORT**
**Fuel Consumption**
Energy efficiency of different modes of goods transport, 9:2633 (R;FI;In Finnish)
Energy efficiency of different modes of person transport, 9:2634 (R;FI;In Finnish)

**LANDFILLS**
*See SANITARY LANDFILLS*
**LANGEVIN EQUATION**
Derivation of the generalized Langevin equation by a method of recurrence relations, 9:4021 (J;US)
**LANGMUIR OSCILLATIONS**
*See PLASMA WAVES*
**LANOXIN**
*See DIGOXIN*
**LANTHANUM 147**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**LANTHANUM 148**
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**LANTHANUM CHROMITES**
*See CHROMIUM OXIDES*
**LANTHANUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**LARGE INTESTINE**
**Biomedical Radiography**
Double contrast method - why is it to be used only at every colon examination, and not at the stomach, 9:3361 (RA;HU;In Hungarian, English)
**LASER FUSION REACTORS**
**Design**
Westinghouse ICF power plant design, 9:4208 (BA;XA)
**LASER ISOTOPE SEPARATION**
Apparatus for enrichment of uranium by double photoionization (Patent application), 9:1916 (TG;US)
Apparatus for isotopic separation using a high-frequency wave and coherent radiation (Patent application), 9:1917 (TG;US)
Process for separation of isotopes from a gaseous mixture (Patent application), 9:1920 (TG;US)
**Charge Exchange**
Process and apparatus for the separtaion of isotopes, 9:1915 (TG;US)
**Kinetics**
Process for isotope separation, 9:1918 (TG;US)
**Optical Pumping**
Optically-pumped mercury vapour cell in coaxial geometry. No. 1. Transport of resonance radiation, 9:2912 (R;US)
Optically-pumped mercury vapour cell in coaxial geometry. 2. Optical pumping by lines in the visible triplet, 9:2913 (R;US)
**Technology Assessment**
Status and prospects for lasers in isotope separation, 9:2064 (J;GB)
**LASER MATERIALS**
**Antireflection Coatings**
Scandium oxide coatings for high-power UV laser applications, 9:2741 (J;US)
**Reflective Coatings**
Scandium oxide coatings for high-power UV laser applications, 9:2741 (J;US)
**LASER RADIATION**
**Absorption**
Time-dependent study of radiation trapping by time-delayed two-photon absorption, 9:3538 (R;US)
**Harmonics**
Interpretation of Livermore third-harmonic-generation experiments, 9:3079 (J;US)
**Mathematical Models**
Interpretation of Livermore third-harmonic-generation experiments, 9:3079 (J;US)
**Polarization**
Interpretation of Livermore third-harmonic-generation experiments, 9:3079 (J;US)
**Uses**
Wafer-scale laser pantography: Fabrication of n-metal-oxide-semiconductor transistors and small-scale integrated circuits by direct-write laser-induced pyrolytic reactions, 9:3103 (J;US)
**LASER SPECTROSCOPY**
Resonance ionization mass spectrometry at Los Alamos National Laboratory, 9:3188 (R;US)
**LASER TARGETS**
**Blackbody Radiation**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Soft X Radiation**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**X-Ray Spectroscopy**
Imaging x-ray spectrometer for laser fusion applications, 9:4138 (J;US)
**LASER-PRODUCED PLASMA**
**Brillouin Effect**
Stimulated Brillouin backscattering in long-scale-length plasmas, 9:4117 (J;US)
**Energy Absorption**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Energy Transfer**
Variation of laser absorption with plasma scalelength in long-scalelength plasmas, 9:4185 (R;US)
**Heat Flux**
Heat flux in the presence of shifting cold and hot electron Maxwellian distributions, 9:4061 (R;JP)
**Interferometry**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Ions**
Generation of super-fast ions due to nonlinear processes near the quarter critical density in laser-produced plasmas, 9:4055 (R;JP)
**Magnetic Fields**
Evolution of spontaneous magnetic fields in an expanding laser-produced plasma, 9:4157 (R;SU;In Russian)
Observation of magnetic fields in laser-produced plasma using the Zeeman effect, 9:4184 (R;US)
**Plasma Diagnostics**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Plasma Waves**
Magnetic surface waves in plasmas, 9:4092 (J;US)
**Shock Waves**
Laser-driven shock wave studies in single and double-layered slab targets, 9:4155 (R;IL)
**Soft X Radiation**
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Ultraviolet Spectra**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**LASERS**
*Light Amplification by Stimulated Emission of Radiation.*
*See also CHEMICAL LASERS*
*RING LASERS*
*SOLID STATE LASERS*
**Power Supplies**
Optimized rotary flux compressors for powering laser flashlamps, 9:4190 (R;US)
**Uses**
Laser processing of semiconductors, 9:2874 (J;US)
**LATTICE FIELD THEORY**
**Coupling**
Complex singularities and distribution of zeros in Ising and gauge models, 9:3819 (R;FR)
**Fermions**
Lattice gauge theories with Susskind fermions at strong coupling. Analytical method and results, 9:3818 (R;FR)
**Gauge Invariance**
Monte Carlo studies of Wilson loops in SU(5) gauge theory in four dimensions, 9:3844 (J;US)
**Heisenberg Picture**
Quantum theory of two-dimensional generalized Toda lattice on bounded spatial interval, 9:3828 (R;SU)

**Ising Model**
Introduction to lattice gauge theories, 9:3829 (R;BR;In Portuguese)
**Partition Functions**
Complex singularities and distribution of zeros in Ising and gauge models, 9:3819 (R;FR)
**Reviews**
Monte Carlo computations in lattice gauge theories, 9:3849 (J;NL)
**SU-5 Groups**
Monte Carlo studies of Wilson loops in SU(5) gauge theory in four dimensions, 9:3844 (J;US)
**Two-Dimensional Calculations**
N = 2 two dimensional Wess-Zumino model on the lattice, 9:3838 (R;IL)
**Wilson Loop**
Monte Carlo studies of Wilson loops in SU(5) gauge theory in four dimensions, 9:3844 (J;US)

**LATTICES (CRYSTAL)**
*See CRYSTAL LATTICES*

**LAWRENCE LIVERMORE LABORATORY**
**Environmental Impacts**
Lawrence Livermore National Laboratory and Sandia National Laboratories--Livermore sites, Livermore, California, 9:3339 (J;US)
**Free Electron Lasers**
Status of the Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory free electron laser (FEL), 9:3152 (R;US)

**LAYERS**
**X-Ray Emission Analysis**
Surface studies with muons, 9:2890 (RA;US)

**LEAD**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Chemical Reactions**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**Compton Effect**
Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°, 9:2700 (R;DE;In German)
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electrorefining**
Electrolyzer for obtaining and refining metals, 9:2711 (TG;US)
Test of electrolytic method for separating bismuth and lead in saline melts, 9:2768 (TJ;US)
**Hadronic Atoms**
Precision measurement of the magnetic moment of the $\Sigma^-$ hyperon, 9:3715 (J;US)
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)
**Removal**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**Uptake**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)

**LEAD 206**
**Energy Levels**
Two-quasiparticle strength distributions in $^{62}$Ni and $^{206}$Pb, 9:3894 (R;SU)

**LEAD 206 TARGET**
**Proton Reactions**
Observation of 2hω hexadecapole strength in lead nuclei from 200 MeV inelastic proton scattering, 9:3927 (J;US)

**LEAD 208 TARGET**
**Alpha Reactions**
Spectroscopy of the neutrons from the decay of the giant quadrupole resonance region in $^{208}$Pb, 9:3921 (R;DE;In German)
**Magnetic Moments**
Electromagnetic properties of isomers in $^{210}$Pb, 9:3925 (J;US)
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)
**Proton Reactions**
Observation of 2hω hexadecapole strength in lead nuclei from 200 MeV inelastic proton scattering, 9:3927 (J;US)
**Triton Reactions**
Electromagnetic properties of isomers in $^{210}$Pb, 9:3925 (J;US)

**LEAD 210**
**Energy Levels**
Electromagnetic properties of isomers in $^{210}$Pb, 9:3925 (J;US)

**LEAD COMPOUNDS**
*See also PZT*
**Pyroelectric Effect**
Pyroelectric energy conversion: Hysteresis loss and temperature sensitivity of a ferroelectric material, 9:2587 (J;US)

**LEAD ISOTOPES**
*See also LEAD 206*
*LEAD 210*
**Beta Decay**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)

**LEAD METHOD**
*See ISOTOPE DATING*

**LEAD ZIRCONITE TITANATE**
*See PZT*

**LEAD-ACID BATTERIES**
**Design**
New lead-acid battery designed by Sandia National Laboratories, 9:2525 (J;US)
**Performance Testing**
New lead-acid battery designed by Sandia National Laboratories, 9:2525 (J;US)
**Research Programs**
New lead-acid battery designed by Sandia National Laboratories, 9:2525 (J;US)

**LEAK DETECTORS**
Improvements to gas detection systems (Catalytic gas detectors), 9:1838 (BA;GB)
Modification for correcting a vacuum design fault in the Veeco Model MS 170 Leak Detector, 9:4186 (R;US)
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Acoustic Measurements**
Feasibility of leak detection in process plant on offshore installations, 9:1846 (R;NO)

**LEAK TESTING**
**Acoustic Monitoring**
Location procedure for sound sources in reactor-technical enclosures, 9:2340 (R;DD)

**LEAKAGE**
*See LEAKS*

**LEAKS**
**Acoustic Monitoring**
Feasibility of leak detection in process plant on offshore installations, 9:1846 (R;NO)
**Detection**
Improvements to gas detection systems, 9:1838 (BA;GB)
**Tracer Techniques**
Helium approach to leak detection, 9:2189 (J;US)
**LEPTON NUMBER**
**Symmetry Breaking**
Nondiagonal Z-decay - Z→anti e+μ, 9:3808 (RA;HU)
**LEPTON REACTIONS**
*See also ELECTRON REACTIONS*
*MUON REACTIONS*
*NEUTRINO REACTIONS*
**Deep Inelastic Scattering**
Deep inelastic lepton-nuclear interactions, 9:3943 (RA;SU;In Russian)
**Structure Functions**
Deep inelastic lepton-nuclear interactions, 9:3943 (RA;SU;In Russian)
**LEPTON-DEUTERON INTERACTIONS**
*See DEUTERIUM TARGET*
*LEPTON REACTIONS*
**LEPTONS**
*See also ELECTRONS*
*MUONS*
*NEUTRINOS*
**Composite Models**
Complex Rishon-type unification, 9:3835 (R;IL)
Composite model for quarks and leptons, 9:3836 (R;IL)
**Quantum Field Theory**
Are lepton and quark families quantized dynamical systems, 9:3742 (R;XA)
**Unified Gauge Models**
Quark-lepton unification and proton decay, 9:3792 (R;XA)
**LETTUCE**
**Contamination**
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
**LEUKEMIA**
**Radiotherapy**
Principles and performances of supralethal whole-body irradiation in case of bone-marrow transplantation of patients with acute leukemia, 9:3372 (RA;HU;In Hungarian, German)
**LICENSING**
*See also REACTOR LICENSING*
**Administrative Procedures**
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
**LIDAR**
*See OPTICAL RADAR*
**LI-DRIFTED GE DETECTORS**
**Pulse Rise Time**
Use of the rise time discriminator for the improvement of the Ge(Li)-detector parameters, 9:3184 (R;SU;In Russian)
**LIE GROUPS**
*See also GRADED LIE GROUPS*
*SO GROUPS*
**Casimir Operators**
Eigenvalues of Casimir operators for the general linear and orthosymplectic Lie superalgebras, 9:4033 (J;US)
**LIE SUPERALGEBRA**
*See GRADED LIE GROUPS*
**LIGANDS**
**Membrane Transport**
Cation fluxes from binary $Ag^+$-M/sup n+/ mixtures in a $H_2O$-$CHCl_3$-$H_2O$ liquid membrane system containing a series of macrocyclic ligand carriers, 9:2904 (J;US)
Selective $M^+$-$H^+$ coupled transport of cations through a liquid membrane by macrocyclic calixarene ligands, 9:2903 (J;US)
**LIGHT**
*See VISIBLE RADIATION*
**LIGHT NUCLEI**
*For nuclei with mass 1-40.*
*See also ALUMINIUM 26*
*BERYLLIUM 9*
*CARBON 11*
*CARBON 12*
*CARBON 13*
*CARBON 14*
*CHLORINE 37*
*DEUTERIUM*
*FLUORINE 18*
*HELIUM 3*
*NITROGEN 13*
*NITROGEN 14*
*NITROGEN 15*
*OXYGEN 16*
*POTASSIUM 40*
*SILICON 28*
*SILICON 29*
*SILICON 30*
*TRITIUM*
**Kaon Minus Reactions**
Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Kaon Plus Reactions**
Singles and coincidence γ-ray experiments in $K^+$ and $K^-$ scattering on nuclei, 9:3907 (RA;US)
**Proton Reactions**
Giant dipole resonances built on excited states, 9:3885 (R;US)
**LIGHT WATER COOLED REACTORS**
*See WATER COOLED REACTORS*
**LIGHTNING**
**Stimulated Emission**
Nuclear-induced lightning aurora experiment. Technical report, 9:3495 (R;US)
**LIGNITE**
**Demineralization**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Devolatilization**
Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78, 9:1774 (R;US)
**Dissolution**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Moisture**
Moisture determination by microwave heating, 9:1788 (R;US)
**Pyrolysis**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**Reduction**
Reduction gas and artificial gas from Rhine crude lignite by application of tube furnace gas generator, 9:1768 (R;DE;In German)
**Solvent-Refined Coal**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**LIMESTONE**
**Dissolution**
Limestone dissolution in flue gas desulfurization processes. Final report Mar 79-Apr 83, 9:1797 (R;US)
**LIMITERS**
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Mathematical Models**
Predicted behaviour of the pumped limiter of INTOR, 9:4145 (R;GB)
**Plasma Sheath**
Applications of hybrid numerical-simulation methods to magnetic-confinement systems, 9:4046 (R;US)
**Vacuum Systems**
Predicted behaviour of the pumped limiter of INTOR, 9:4145 (R;GB)
**LINACS**
*See LINEAR ACCELERATORS*
**LINEAR ACCELERATORS**
*See also FMIT LINAC*
*QUADRUPOLE LINACS*
**Beam Dynamics**
Effect of diaphragms on the electron beam stability in an induction linear accelerator, 9:3133 (R;SU;In Russian)
Time-resolved beam-profile measurements on the Experimental Test Accelerator (ETA), 9:3137 (R;US)
**Beam Profiles**
Time-resolved beam-profile measurements on the Experimental Test Accelerator (ETA), 9:3137 (R;US)

**Design**
Electron linacs for laser and radiographic applications, 9:3127 (J;US)
Some specialized radiological safety considerations at Argonne National Laboratory's heavy ion research facility, 9:3157 (J;US)
**Electron Beams**
Effect of diaphragms on the electron beam stability in an induction linear accelerator, 9:3133 (R;SU;In Russian)
**Energy Efficiency**
Some aspects of superconducting accelerator design, 9:3122 (J;US)
**Performance**
Some aspects of superconducting accelerator design, 9:3122 (J;US)
**Positron Beams**
Low energy positron production at the Livermore linac, 9:3126 (J;US)
**Superconducting Devices**
Some aspects of superconducting accelerator design, 9:3122 (J;US)

**LINEAR PINCH DEVICES**
*See also LINEAR Z PINCH DEVICES*
**Magnetic Fields**
External magnetic field configurations for EXTRAP, 9:4187 (R;SE)

**LINEAR Z PINCH DEVICES**
**Plasma Heating**
Equilibrium, stability and heating of plasmas in linear and toroidal Extrap pinches, 9:4126 (BA;XA)
**Stability**
Equilibrium, stability and heating of plasmas in linear and toroidal Extrap pinches, 9:4126 (BA;XA)

**LIOUVILLE EQUATION**
*See BOLTZMANN-VLASOV EQUATION*

**LIPIDS**
**Chemical Analysis**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)
**Chemical Bonds**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)
**Fluorescence**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)

**LIQUEFIED NATURAL GAS**
**Gas Spills**
LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices, 9:1879 (R;US)
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
Recent results in simulating LNG vapor dispersion over variable terrain. Revision 1, 9:1880 (R;US)
**Maritime Transport**
Long distance transport of LNG via cryogenic pipeline, 9:1897 (BA;GB)
**Materials Handling**
Offshore LNG transfer system, 9:1896 (BA;GB)

**LIQUID ASPHALT**
*See PETROLEUM RESIDUES*

**LIQUID METAL COOLANT**
*See LIQUID METALS*

**LIQUID METALS**
**Chemical Reactions**
Summary of HEDL Fusion Reactor Safety Support studies, 9:4160 (RA;XA)
**Fire Hazards**
Summary of HEDL Fusion Reactor Safety Support studies, 9:4160 (RA;XA)

**LIQUID METAL-WATER REACTIONS**
*See MOLTEN METAL-WATER REACTIONS*

**LIQUID SCINTILLATION DETECTORS**
**Construction**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)
**Underground**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)

**LIQUID SCINTILLATORS**
**Response Functions**
Application of the Monte Carlo method to the study of the response of an organic liquid scintillator irradiated by photons, 9:3168 (R;FR;In French)

**LIQUIDS**
*See also COAL LIQUIDS*
*LIQUID METALS*
**Evaporation**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Light Scattering**
Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3599 (J;US)
**Nucleation**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Shear**
Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3599 (J;US)
**Structure Factors**
Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3599 (J;US)
**Superheating**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)

**LITHIUM**
**Catalytic Effects**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Corrosive Effects**
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2674 (R;US)
Materials behaviour in the liquid alkali metals lithium and sodium, 9:2742 (B;GB)
**De-Excitation**
Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma, 9:3565 (J;US)
**Electron-Atom Collisions**
Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma, 9:3565 (J;US)
**Excited States**
Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma, 9:3565 (J;US)
**Photoionization**
Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma, 9:3565 (J;US)

**LITHIUM 6 REACTIONS**
**Compound-Nucleus Reactions**
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)

**LITHIUM 7 TARGET**
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)

**LITHIUM ALLOYS**
**Electronic Structure**
Electronic structure of scandium lithide, 9:2722 (J;US)

**LITHIUM CARBIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Structural Chemical Analysis**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)

**LITHIUM CHLORIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)

**Chemical Reactions**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)

**LITHIUM COMPOUNDS**
*See also LITHIUM CARBIDES*
*LITHIUM HYDRIDES*
*LITHIUM OXIDES*
*LITHIUM SILICATES*

**Aluminates**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**Atom-Molecule Collisions**
Study of excited state energy transfer processes. Final report 1 Jan 81-31 Dec 82, 9:3506 (R;US)

**Clathrates**
Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82, 9:2517 (R;US)

**Diffusion**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**Ionic Conductivity**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**Luminescence**
Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate, 9:2827 (R;US)

**Production**
Investigation of the electrochemical formation of Li-C intercalation compounds. Final report FY82, 9:2517 (R;US)

**LITHIUM HYDRIDES**

**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**LITHIUM IONS**

**Energy Losses**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)

**Ion Sources**
High-intensity lithium-ion source, 9:3153 (J;US)

**LITHIUM OXIDES**

**Diffusion**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**Ionic Conductivity**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**LITHIUM SILICATES**

**Diffusion**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**Ionic Conductivity**
Lithium movement and tritium (hydrogen) behaviors in $Li_2O$, $Li_2SiO_3$ and $LiAlO_2$, 9:2822 (R;JP;In Japanese)

**LIVER**

**Neoplasms**
Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital, 9:3421 (J;US)

**Radionuclide Kinetics**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)

**LMFBR TYPE REACTORS**
*See also BELOYARSK-3 REACTOR*
*BOR-60 REACTOR*
*CLINCH RIVER BREEDER REACTOR*
*PHENIX REACTOR*
*SNR-1 REACTOR*

**Breeding Blankets**
Neutron physical and thermohydraulic investigations on the fissile fuel production with spallation neutrons, 9:1924 (R;DE;In German)

**Education**
Breeder reactor engineering education at the University of Arizona, 9:2287 (J;US)

**Fuel Assemblies**
Fusion welding process, 9:2721 (P;US)
The TCLUST1 transient LMFBR intersubassembly heat transfer code, 9:2295 (J;US)

**Fuel Cans**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)

**Fuel Element Failure**
Application of experimental data to the estimation of fuel pin failure probability, 9:2292 (J;US)

**Fuel Pins**
Application of experimental data to the estimation of fuel pin failure probability, 9:2292 (J;US)
Characterization of actinide physics specimens for the US/UK joint experiment in the Dounreay Prototype Fast Reactor, 9:2282 (R;US)
Performance of high plutonium weight fraction mixed-oxide fuel, 9:2293 (J;US)

**Fuel Rods**
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2400 (R;US)

**Fuel-Cladding Interactions**
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)

**Mixed Oxide Fuels**
Performance of high plutonium weight fraction mixed-oxide fuel, 9:2293 (J;US)
Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2463 (J;US)

**Molten Metal-Water Reactions**
Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants, 9:2278 (R;FR;In French)

**Nuclear Engineering**
Breeder reactor engineering education at the University of Arizona, 9:2287 (J;US)

**Reactor Accidents**
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2400 (R;US)

**Reactor Core Disruption**
Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2463 (J;US)

**Reactor Materials**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)

**Reactor Safety**
Breeder reactor engineering education at the University of Arizona, 9:2287 (J;US)

**Reactor Vessels**
Scoping calculations for design and analysis of large reactor vessels for liquid-metal fast breeder reactor (LMFBR) plants, 9:2296 (BA;US)

**Spent Fuel Casks**
A spent fuel storage system for LMFBR fuel experiments, 9:2289 (J;US)

**Spent Fuel Storage**
A spent fuel storage system for LMFBR fuel experiments, 9:2289 (J;US)

**Steam Generators**
Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes, 9:2275 (R;US)

**Thorium Cycle**
Basic analyses and a comparison of the characteristics of the GCFR and the LMFBR with the thorium cycle in one - group diffusion theory, 9:2294 (B;BR;In Portuguese)
**Transient Overpower Accidents**
Calibration and qualification of the Los Alamos failure model, 9:2462 (J;US)

**LNG**
*See LIQUEFIED NATURAL GAS*

**LNG SPILLS**
*See GAS SPILLS*

**LOADING (REACTOR)**
*See REACTOR FUELING*

**LOCA**
*See LOSS OF COOLANT*

**LOCAL GOVERNMENT**
**Energy Accounting**
State and local responses to natural gas price increases, 9:2553 (R;US)

**LONGITUDINAL PINCH DEVICES (LINEAR)**
*See LINEAR Z PINCH DEVICES*

**LONGWALL MINING**
**Continuous Miners**
Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82, 9:1802 (R;US)
**Dusts**
Effects of engineering parameters on the control of respirable dust. Open file report Oct 78-Mar 82, 9:1802 (R;US)
**Supports**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)

**LOSS OF COOLANT**
**Computer Calculations**
Experience reprogramming TRAC for the HEP computer, 9:2460 (J;US)
**Computerized Simulation**
CANDU safety research. A status report, 9:2417 (RA;CA)
PWR small-break analysis using a PDP-11/AD-10 computer system, 9:2459 (J;US)
**Heat Transfer**
Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3, 9:2433 (R;JP)
Experience reprogramming TRAC for the HEP computer, 9:2460 (J;US)
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)
Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2419 (RA;CA)
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2443 (R;US)
NRC plant-analyzer development at BNL (BWR), 9:2397 (R;US)
PWR small-break analysis using a PDP-11/AD-10 computer system, 9:2459 (J;US)
SCTF Core-I test results. System pressure effects on reflooding phenomena, 9:2432 (R;JP)
Summary results of the LOCA Simulation Program conducted in NRU, 9:2444 (R;US)
**Hydraulics**
Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3, 9:2433 (R;JP)
Experience reprogramming TRAC for the HEP computer, 9:2460 (J;US)
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)
Experimental investigation of heat transfer from a reactor fuel channel to surrounding water, 9:2419 (RA;CA)
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2443 (R;US)
NRC plant-analyzer development at BNL (BWR), 9:2397 (R;US)
PWR small-break analysis using a PDP-11/AD-10 computer system, 9:2459 (J;US)
SCTF Core-I test results. System pressure effects on reflooding phenomena, 9:2432 (R;JP)
Summary results of the LOCA Simulation Program conducted in NRU, 9:2444 (R;US)
**Radiation Hazards**
An assessment of the radiological consequences of postulated reactor accidents, 9:2480 (J;US)
**Reactor Simulators**
NRC plant-analyzer development at BNL (BWR), 9:2397 (R;US)
**Technology Transfer**
An assessment of the radiological consequences of postulated reactor accidents, 9:2480 (J;US)
**Test Facilities**
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)
**Two-Phase Flow**
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)

**LOUISIANA**
**Strategic Petroleum Reserve**
Baseline assessment of the Strategic Petroleum Reserve Project Management Office, 9:1863 (R;US)

**LOVIISA-1 REACTOR**
*Prior to 1976, LOVIISA REACTOR was used.*
**Air Cleaning Systems**
Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations, 9:2219 (RA;XA)
**Off-Gas Systems**
Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations, 9:2219 (RA;XA)

**LOVIISA-2 REACTOR**
**Air Cleaning Systems**
Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations, 9:2219 (RA;XA)
**Off-Gas Systems**
Testing practice and operating experience of off-gas cleaning systems gained during the first years of operation at Finnish PWR nuclear power stations, 9:2219 (RA;XA)

**LOW TEMPERATURE**
**Biological Effects**
Low temperature tolerance and cold hardening of cacti, 9:3382 (J;US)

**LOW-BETA PLASMA**
*Beta from 0 to 0.01.*
**Drift Instability**
Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4090 (J;US)
**Fluctuations**
Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4090 (J;US)
**Kink Instability**
Reduced equations for internal kinks in tokamaks, 9:4114 (J;US)
**Magnetohydrodynamics**
Reduced equations for internal kinks in tokamaks, 9:4114 (J;US)
**Nonlinear Problems**
Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4090 (J;US)
**Turbulence**
Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4090 (J;US)

**LOWER HYBRID HEATING**
**Computerized Simulation**
Theory and simulation of RF heating and current drive, 9:4133 (BA;XA)
**Nonlinear Problems**
Echo phenomenon associated with lower-hybrid wave launching, 9:4110 (J;US)

**LOWER HYBRID RESONANCE HEATING**
*See LOWER HYBRID HEATING*

**LOW-LEVEL RADIOACTIVE WASTES**
**Biodegradation**
Biotechnology and environmental programs, 9:3388 (RA;US)
**Classification**
Concentrations of selected short-lived isotopes in a low-level waste inventory, 9:2009 (J;US)
Radwaste characterization: key to an optimized waste management plan, 9:2007 (J;US)
**Government Policies**
Regional compacting for low-level radioactive waste management: an innovative approach, 9:2003 (J;US)
**Marine Disposal**
Sea dumping of radioactive wastes. Part 1: Basic considerations of marine environment, 9:1990 (R;AT;In German)
Sea dumping of radioactive wastes. Part 2: Behaviour of radionuclides in seawater, 9:1991 (R;AT;In German)
Sea dumping of radioactive wastes. Part 3: Dumping practice and radioecology, 9:1992 (R;AT;In German)

**LUBRICATING OILS**
**Recycling**
Re-refining of industrial spent oils, 9:1852 (R;FI;In Finnish)

**LUMBER INDUSTRY**
*See WOOD PRODUCTS INDUSTRY*

**LUMINAL**
*See PHENOBARBITAL*

**LUNAR MATERIALS**
**Transmutation**
Cosmologic studies at LAMPF II: the production of cosmogenic nuclides by energetic secondary particles, 9:3445 (RA;US)

**LUNGS**
**Delayed Radiation Effects**
Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3399 (J;US)
**Early Radiation Effects**
Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3399 (J;US)
**Metabolism**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)

**LURGI SLAGGING PROCESS**
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)

**LWBR TYPE REACTORS**
**Fuel Assemblies**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)
**Fuel Rods**
Local heat transfer where heated rods touch in axially flowing water, 9:2436 (R;US)
**Reactor Accidents**
Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2437 (R;US)
**Reactor Cores**
Core subchannel thermal-hydraulic analysis methods and critical heat-flux margin in a light-water breeder reactor, 9:2281 (R;US)
**Thorium Cycle**
Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program), 9:2280 (R;US)

**LWR TYPE REACTORS**
*See WATER COOLED REACTORS*

## M

**MA 754**
*See NICKEL BASE ALLOYS*

**MA 956**
*See IRON BASE ALLOYS*

**MACERALS**
**Centrifugation**
Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1781 (R;US)
**Hydrogen Transfer**
Reactions governing coal solubilization. First quarterly progress report, July 15, 1983-October 15, 1983, 9:1766 (R;US)
**Infrared Spectra**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties (Vitrinite), 9:1783 (R;US)
**Mass Spectroscopy**
Laser micropyrolysis of coal macerals. Final report Oct 79-Mar 83, 9:1772 (R;US)
**Reflectivity**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties (Vitrinite), 9:1783 (R;US)
Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82, 9:1890 (R;US)
**Refractivity**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties (Vitrinite), 9:1783 (R;US)
**Structural Chemical Analysis**
Application of 2-D and dipolar dephasing $^{13}C$ NMR techniques to the study of structural variations in coal macerals, 9:1781 (R;US)

**MAGELLANIC CLOUDS**
**Star Clusters**
Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3452 (R;US)
**Star Evolution**
Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3452 (R;US)

**MAGNESIUM**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)

**MAGNESIUM 25 TARGET**
**Proton Reactions**
Nucleosynthesis of $^{26}Al$ at low stellar temperatures, 9:3484 (J;US)

**MAGNESIUM ALLOYS**
**Stress Corrosion**
Stress corrosion testing of 5083 aluminum, 9:2751 (J;US)

**MAGNESIUM COMPLEXES**
**Excitation**
Photoinduced electron-transfer reactions in a chlorophyllide-pheophorbide cyclophane. A model for photosynthetic reaction centers, 9:3011 (J;US)
**Fluorescence**
Photoinduced electron-transfer reactions in a chlorophyllide-pheophorbide cyclophane. A model for photosynthetic reaction centers, 9:3011 (J;US)

**MAGNESIUM OXIDES**
**Absorptivity**
Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2786 (J;US)

**Color Centers**
Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2786 (J;US)
**Electron Collisions**
Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2786 (J;US)
**Photoemission**
Luminescence from oxygen vacancies in MgO crystals thermochemically reduced at high temperatures, 9:2787 (J;US)
**Photoluminescence**
Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2786 (J;US)
Luminescence from oxygen vacancies in MgO crystals thermochemically reduced at high temperatures, 9:2787 (J;US)
**Stress Relaxation**
Stress-relaxation technique for deformation studies in four-point bend tests: application to polycrystalline ceramics at elevated temperatures, 9:2799 (J;GB)
**Thermoluminescence**
Charge and mass transfer involving hydrogen in MgO crystals thermochemically reduced at high temperatures, 9:2786 (J;US)

**MAGNESIUM SILICATES**
**Enthalpy**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)
**Specific Heat**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)

**MAGNET COILS**
**Specifications**
Near-term tokamak reactor designs with high performance resistive magnets, 9:4201 (BA;XA)

**MAGNETIC BREMSSTRAHLUNG**
*See SYNCHROTRON RADIATION*

**MAGNETIC COILS**
*See MAGNET COILS*

**MAGNETIC COMPRESSION**
Optimized rotary flux compressors for powering laser flashlamps, 9:4190 (R;US)

**MAGNETIC FIELDS**
*See also GEOMAGNETIC FIELD*
*INTERSTELLAR MAGNETIC FIELDS*
**Plasma Jets**
Electrostatic Kelvin—Helmholtz instability in a radially injected plasma cloud, 9:4101 (J;US)

**MAGNETIC MATERIALS**
*See also ANTIFERROMAGNETIC MATERIALS*
*FERROMAGNETIC MATERIALS*
**AC Losses**
Calorimeter for measuring ac magnetic losses in small samples, 9:3217 (J;US)
**Muon Probes**
Studies of magnetic phase transitions with muons (LAMPF II experiment planning), 9:2704 (RA;US)
**Order-Disorder Transformations**
Studies of magnetic phase transitions with muons (LAMPF II experiment planning), 9:2704 (RA;US)

**MAGNETIC MONOPOLES**
**Catalytic Effects**
Catalysis of flavor nonconservation by monopoles, 9:3784 (J;US)
**Commutators**
Fractional charge and anomalous commutators, 9:3840 (R;IL)
**Detection**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)
**Scattering**
Time delay and the dyon charge, 9:3780 (J;US)
**Symmetry Breaking**
Relation mr << 1 in the preon model, 9:3825 (R;XA)

**MAGNETIC PROBES**
**Frequency Response Testing**
High-frequency magnetic measurements using small inductive probes, 9:3210 (J;US)
**Operation**
High-frequency magnetic measurements using small inductive probes, 9:3210 (J;US)

**MAGNETOHYDRODYNAMIC CHANNELS**
*See MHD CHANNELS*

**MAGNETOHYDRODYNAMIC GENERATORS**
*See MHD GENERATORS*

**MAGNETOHYDRODYNAMIC WAVES**
*See HYDROMAGNETIC WAVES*

**MAGNETOHYDRODYNAMICS**
**Nonlinear Problems**
Nonlinear magnetohydrodynamic. Summary of recent activity (Task I). Progress report, 9:4047 (R;US)

**MAGNETOSPHERE**
*See also MAGNETOTAIL*
**Magnetic Bays**
Development of substorm activity in multiple-onset substorms at synchronous orbit, 9:3499 (J;US)
**Magnetic Storms**
ISEE 3 high time resolution study of interplanetary parameter correlations with magnetospheric activity, 9:3502 (J;US)
**Plasma Waves**
Polar cap electron DEnsities from de-1 plasma wave observations. Progress report, 9:3494 (R;US)
**Shock Waves**
Evolution of ion distributions across the nearly perpendicular bow shock: specularly and non-specularly reflected-gyrating ions, 9:3501 (J;US)
**Solar Wind**
Evolution of ion distributions across the nearly perpendicular bow shock: specularly and non-specularly reflected-gyrating ions, 9:3501 (J;US)

**MAGNETOTAIL**
**Electric Fields**
Comparison of spherical double probe electric field measurements with plasma bulk flows in plasmas having densities less than 1 $cm^{-3}$, 9:3504 (J;US)
**Plasma Sheet**
Plasma regimes in the deep geomagnetic tail: ISEE 3, 9:3500 (J;US)
**Vortices**
New observations of plasma vortices and insights into their interpretation, 9:3503 (J;US)

**MAGNOX TYPE REACTORS**
**Coolants**
Measurement of moisture in nuclear coolant gases. Experience and new developments within the CEGB, 9:2242 (R;XA)

**MAHOGANY TREES**
*See TREES*

**MALIGNANCIES**
*See NEOPLASMS*

**MAMMARY GLANDS**
**Carcinomas**
Electron beam therapy of breast carcinoma. Pt. 3. Early results, 9:3368 (RA;HU;In Hungarian, English)
**Irradiation Procedures**
Electron therapy of breast carcinoma. Pt. 1. Treatment planning, 9:3367 (RA;HU;In Hungarian, English)
Physical investigation on the postoperative chest wall irradiation with tangential cobalt moving beam, 9:3366 (RA;HU;In Hungarian, English)
Tangential moving (pendel) technique in postoperative irradiation of breast cancer, 9:3365 (RA;HU;In Hungarian, English)

**MANGANESE**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)

**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**MANGANESE 54**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**MANGANESE BASE ALLOYS**
**Muon Probes**
Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass, 9:2720 (J;US)
**Spin-Lattice Relaxation**
Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass, 9:2720 (J;US)
**MANNOSE**
**Labelling**
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
**MANUFACTURING FACILITIES**
*See INDUSTRIAL PLANTS*
**MANY-BODY PROBLEM**
**Phase Space**
Quantum collision theory with phase-space distribution functions, 9:4027 (J;US)
**Schwinger Variational Method**
Schwinger variational method for the Bloch equation, 9:4025 (J;US)
**MARCOULE PHENIX REACTOR**
*See PHENIX REACTOR*
**MARINE ECOSYSTEMS**
*See AQUATIC ECOSYSTEMS*
**MARITIME TRANSPORT**
**Fuel Consumption**
Energy efficiency of different modes of goods transport, 9:2633 (R;FI;In Finnish)
**MARYLAND**
**Baseline Ecology**
Survey of water quality and flow in Maryland coastal zone streams: a data report. Final report, 9:3337 (R;US)
**MASS SPECTROMETERS**
**Electron Guns**
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, July 15, 1982-October 14, 1982, 9:2120 (R;US)
**MASS SPECTROSCOPY**
**Data Processing**
New robust method for the treatment of analytical data, 9:3206 (R;ZA)
**Uses**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)
**MASSACHUSETTS INSTITUTE OF TECHNOLOGY ALC**
*See ALCATOR DEVICE*
**MASURIUM**
*See TECHNETIUM*
**MATERIALS (ANTIFERROMAGNETIC)**
*See ANTIFERROMAGNETIC MATERIALS*
**MATERIALS (BUILDING)**
*See BUILDING MATERIALS*
**MATERIALS (COMPOSITE)**
*See COMPOSITE MATERIALS*
**MATERIALS (FERROMAGNETIC)**
*See FERROMAGNETIC MATERIALS*
**MATERIALS HANDLING EQUIPMENT**
**Design**
Offshore LNG transfer system, 9:1896 (BA;GB)
**MATERIALS (LUNAR)**
*See LUNAR MATERIALS*
**MATERIALS (MAGNETIC)**
*See MAGNETIC MATERIALS*
**MATERIALS (POROUS)**
*See POROUS MATERIALS*
**MATERIALS (SEMICONDUCTOR)**
*See SEMICONDUCTOR MATERIALS*
**MATHEMATICAL MODELS**
*See also ATOMIC MODELS*
*COSMOLOGICAL MODELS*
*STAR MODELS*
**Comparative Evaluations**
An evaluation of current models for the propagation of stress-corrosion cracks, 9:2767 (J;US)
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**Data Covariances**
Robust analysis of aggregation error, 9:3343 (J;US)
**MAXWELL EQUATIONS**
Fourier optics for the Maxwell field: formalism and applications, 9:3997 (R;US)
**MAXWELL-BOLTZMANN EQUATION**
*See BOLTZMANN EQUATION*
**MEASURING INSTRUMENTS**
*Use of a more specific term is recommended.*
*See also CALORIMETERS*
*INTERFEROMETERS*
*MULTISPECTRAL SCANNERS*
*RADIATION DETECTORS*
*RADIOMETRIC GAGES*
*SPECTROMETERS*
*VISCOSIMETERS*
**Design**
Temperature profile detector, 9:2334 (P;US)
**Performance**
IAEA experience with authentication of in-plant NDA instrumentation, 9:2055 (BA;XA)
**MECHANICAL STRUCTURES**
*See also BELLOWS*
*SUPPORTS*
**Stress Analysis**
To the calculation of stress-strained state of the discharge chambers of tokamak devices, 9:4183 (R;SU;In Russian)
**MECHANICAL TESTS**
*See also the properties tested.*
Development of an apparatus for testing fatigue of metals at elevated temperatures in controlled environments, 9:3093 (R;JP;In Japanese)
**Sample Preparation**
Design and use of nonstandard tensile specimens for irradiated materials testing, 9:3088 (R;US)
**MEDITERRANEAN SEA**
*See also ADRIATIC SEA*
**Pipelines**
Castoro Sei introduces new standards of reliability and efficiency in pipelaying, 9:1895 (BA;GB)
**MEDIUM-BETA PLASMA**
*Beta from 0.01 to 0.1.*
**Nonlinear Problems**
Nonlinear coupling of drift waves, convective cells, and magnetic drift modes in finite-$\beta$ plasmas, 9:4120 (J;US)
**Transport Theory**
Nonlinear coupling of drift waves, convective cells, and magnetic drift modes in finite-$\beta$ plasmas, 9:4120 (J;US)
**MELANOMAS**
**Risk Assessment**
Melanoma case-control study at the Los Alamos National Laboratory, 9:3389 (J;GB)
**MELTDOWN**
**Failure Mode Analysis**
Systemic event tree methodolgoy employed in the Interim Reliability Evaluation Program (IREP), 9:2492 (BA;US)
**Fuel-Coolant Interactions**
Core melt/coolant interactions: modelling (PWR; BWR), 9:2447 (R;US)
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Heat Transfer**
High pressure melt ejection, 9:2449 (R;US)
**Hydraulics**
High pressure melt ejection, 9:2449 (R;US)
**Molten Metal-Water Reactions**
Core melt/coolant interactions: modelling (PWR; BWR), 9:2447 (R;US)
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)

**Risk Assessment**
Systemic event tree methodolgoy employed in the Interim Reliability Evaluation Program (IREP), 9:2492 (BA;US)
**Test Facilities**
High pressure melt ejection, 9:2449 (R;US)
**MELTING**
**Computerized Simulation**
Monte Carlo simulation study of the two-dimensional melting mechanism, 9:3987 (J;US)
**Two-Dimensional Calculations**
Phase transitions in two dimensions, 9:3518 (RA;BR)
**MEMBRANES**
**Efficiency**
Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83, 9:1874 (R;US)
**Moessbauer Effect**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)
**Permeability**
Facilitated transport liquid membrane separations for the gas industry. Final report Feb 82-Jan 83, 9:1874 (R;US)
**X-Ray Spectroscopy**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)
**MENDELEVIUM 256**
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)
**MERCURY**
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Chemical Reactions**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Removal**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**Uptake**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)
**Water Chemistry**
Investigations on heavy methal complexing by humin substances in estuaries, 9:2972 (R;DE;In German)
**MERCURY 202 TARGET**
**Proton Reactions**
Global test of modified precompound decay models, 9:3924 (J;US)
**MERCURY IODIDES**
**Crystal Growth**
Raman scattering study of $HgI_2$ crystal structure perfection, 9:2824 (RA;SU;In Russian)
**Crystal Structure**
Raman scattering study of $HgI_2$ crystal structure perfection, 9:2824 (RA;SU;In Russian)
**MERCURY ISOTOPES**
**Beta Decay**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)
**Energy Levels**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)
**MERCURY TELLURIDES**
**Refractivity**
Linear and nonlinear intensity dependent refractive index of Hg/sub 1-x/Cd/sub x/Te, 9:2842 (J;US)
**MESIC ATOMS**
*See also KAONIC ATOMS*
**X-Ray Spectra**
Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3531 (R;SU;In Russian)
**MESOATOMS**
*See MESIC ATOMS*
**MESON RESONANCES**
*See also B-1235 RESONANCES*
*E-1422 RESONANCES*
**Decay**
Measurement of the lifetime of bottom hadrons, 9:3710 (J;US)
**Particle Production**
Vector meson spin alignment in the fusion madel, 9:3766 (R;SU;In Russian)
**Semileptonic Decay**
Lifetime of particles containing b quarks, 9:3717 (J;US)
**Spin Orientation**
Vector meson spin alignment in the fusion madel, 9:3766 (R;SU;In Russian)
**MESON-BARYON INTERACTIONS**
*See also KAON-DEUTERON INTERACTIONS*
*MESON-NUCLEON INTERACTIONS*
**Coupling Constants**
Constant of the baryon-meson strong interaction, 9:3764 (R;SU;In Russian)
**MESON-DEUTERON INTERACTIONS**
*See DEUTERIUM TARGET*
**MESON-NUCLEON INTERACTIONS**
*See also KAON-NUCLEON INTERACTIONS*
*PION-NUCLEON INTERACTIONS*
Meson-nucleon systems, 9:3666 (RA;US)
**Scattering Amplitudes**
Large-angle hadron scattering at high energies, 9:3761 (RA;SU;In Russian)
**MESONS**
*See also MESON RESONANCES*
*POMERANCHUK PARTICLES*
*SCALAR MESONS*
**Bethe-Salpeter Equation**
SU(N)-$QCD_2$ meson equation in next-to-leading order, 9:3800 (R;XA)
**Particle Production**
New horizons in nuclear physics, 9:3858 (RA;US)
**MESSENGER-RNA**
**Molecular Structure**
Nuclear genes from Nicotiana encoding the small subunit of ribulose-1,5-bisphosphate carboxylase. Technical progress report, 9:3344 (R;US)
**METABOLISM**
**Inhibition**
Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism, 9:3422 (J;US)
**METABOLITES**
**DNA Adducts**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Liquid Column Chromatography**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Mass Spectra**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Mutagen Screening**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Ultraviolet Spectra**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**METAGALAXY**
*See UNIVERSE*
**METAL INDUSTRY**
**Air Cleaning Systems**
Industrial local exhaust systems, 9:3262 (R;FI;In Finnish)

**Exhaust Systems**
Industrial local exhaust systems, 9:3262 (R;FI;In Finnish)
**Health Hazards**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)
**Occupational Diseases**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)

**METAL-GAS BATTERIES**
*See also NICKEL-HYDROGEN BATTERIES*
**Design**
Rapidly refuelable fuel cell, 9:2524 (P;US)

**METALS**
*See also ACTINIDES*
*ALUMINIUM*
*ANTIMONY*
*BISMUTH*
*CADMIUM*
*GERMANIUM*
*INDIUM*
*LEAD*
*LIQUID METALS*
*MERCURY*
*POLONIUM*
*TIN*
*TRANSITION ELEMENTS*
*ZINC*
**Complexes**
Calculations on spin-paired species in metal-ammonia solutions, 9:2938 (J;US)
**Crystal Defects**
Temperature-dependent behavior of positron annihilation in metals, 9:2766 (BA;US)
**Electron Density**
Electron density in reasonably real metallic surfaces, including interchange and correlation effects, 9:3514 (RA;BR;In Spanish)
**Electrorefining**
Electrolyzer for obtaining and refining metals, 9:2711 (TG;US)
**Flow Stress**
A form of Hall-Petch law for the strength of glassy metals, 9:2764 (J;DD)
**Physical Radiation Effects**
Dynamics of radiation-induced point defects in metals, 9:2686 (R;SU;In Russian)
**Plasmons**
Plasmons in the interphase between two metals, 9:2688 (RA;BR;In Portuguese)
**Sorptive Properties**
Absorption of spin-dependent electrons in metals, 9:2697 (RA;BR;In Spanish)
**Surface Properties**
Electron density in reasonably real metallic surfaces, including interchange and correlation effects, 9:3514 (RA;BR;In Spanish)
**Vacancies**
Temperature-dependent behavior of positron annihilation in metals, 9:2766 (BA;US)

**METAL-WATER REACTIONS**
*See MOLTEN METAL-WATER REACTIONS*

**METEORITES**
**Transmutation**
Cosmologic studies at LAMPF II: the production of cosmogenic nuclides by energetic secondary particles, 9:3445 (RA;US)

**METHANE**
**Binary Mixtures**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983 (Methane, carbon dioxide, carbon monoxide, hydrogen: binary mixtures with organic solvents; ASPEN; also properties of pure organic solvents with equations), 9:1761 (R;US)
**Critical Temperature**
Electron attachment to oxygen in supercritical hydrocarbon fluids, 9:2976 (J;US)
**Detection**
Improvements to gas detection systems, 9:1838 (BA;GB)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Ion-Molecule Collisions**
First observation of the Thomas peak in continuum capture: Capture of H atoms from $CH_4$ molecules by fast $Ar^+$ projectiles, 9:3555 (J;US)
**Migration**
Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1870 (R;US)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Natural Occurrence**
Geologic investigation of the methane potential of Western U.S. coal beds. Final report Dec 80-Jun 82, 9:1890 (R;US)
**Origin**
Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1870 (R;US)
Studies related to the deep earth gas. Annual report Jan-Dec 82, 9:1871 (R;US)
**Oxidation**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Phase Studies**
Vapor liquid equilibrium study of the $H_3CH_4$ system at low temperatures and elevated pressures. Research report (annual) Jan-Dec 79, 9:2077 (R;US)
**Production**
Amount of biogas and its availability for use in Finland, 9:2108 (R;FI;In Finnish)
Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82, 9:2074 (R;US)
Evaluation of gas producing potential from unmineable coal seams, 9:1877 (RA;US)
Marine biomass program: anaerobic digestion systems development and stability study. Final report 1 Feb-31 Dec 82, 9:2079 (R;US)
**Purification**
Basic science and technology, 9:1928 (RA;US)
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)
**Quantitative Chemical Analysis**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**Quantity Ratio**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**Recovery**
Evaluation of gas producing potential from unmineable coal seams, 9:1877 (RA;US)
**Separation Processes**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)
**Synthesis**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropech synthesis, 9:2081 (J;US)
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83, 9:2075 (R;US)
**Uses**
Amount of biogas and its availability for use in Finland, 9:2108 (R;FI;In Finnish)

**METHANOL**
**Bioconversion**
Methanol bioconversion by Butyribacterium methylotrophicum--batch fermentation yield and kinetics, 9:2127 (J;US)

**Chemical Preparation**
Activity and selectivity studies on silica supported Fischer-Tropsch catalyst, 9:2995 (D;US)
**Storage Facilities**
Underwater storage tank system: a new conception for the storage of oil and methanol, 9:1864 (BA;GB)
**Synthesis**
Reduction of CO2 to methanol and methane by photo and dark reactions on semiconductor electrodes. Annual report Feb 82-Feb 83, 9:2075 (R;US)

**METHANOL PLANTS**
**Offshore Sites**
Safety problems in connection with offshore process plants, using, as example, a methanol production plant for gas fields, 9:1875 (BA;GB)
**Safety**
Safety problems in connection with offshore process plants, using, as example, a methanol production plant for gas fields, 9:1875 (BA;GB)

**METHIONINE**
**NMR Spectra**
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)
**Spin-Lattice Relaxation**
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)

**METHYL ALCOHOL**
*See METHANOL*

**METHYL IODIDE**
**Excitation**
Real-time detection of methyl radicals by diode laser absorption at 608 $cm^{-1}$, 9:3023 (J;NL)
**Rydberg States**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)

**METHYL PHENOLS**
*See CRESOLS*

**METHYL PYRIDINES**
*See PICOLINES*

**METHYL RADICALS**
**Absorption Spectroscopy**
Real-time detection of methyl radicals by diode laser absorption at 608 $cm^{-1}$, 9:3023 (J;NL)
**Chemical Reaction Yield**
Real-time detection of methyl radicals by diode laser absorption at 608 $cm^{-1}$, 9:3023 (J;NL)
**Electronic Structure**
Theoretical study of the properties of methyl radical, 9:3589 (J;US)
**Molecular Structure**
Theoretical study of the properties of methyl radical, 9:3589 (J;US)

**METHYL VIOLOGEN**
*See BIPYRIDINES*

**METHYLBENZENE**
*See TOLUENE*

**3-METHYLCHOLANTHRENE**
**Biological Effects**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)

**METHYLENE BLUE**
**Chemical Reactions**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)

**METHYL-FUEL**
*See ALCOHOLS*
*METHANOL*

**METHYLMERCAPTOAMINOBUTYRIC ACID**
*See METHIONINE*

**METHYLTHIOAMINOBUTYRIC ACID**
*See METHIONINE*

**METROPOLITAN AREAS**
*See URBAN AREAS*

**MHD CHANNELS**
**Design**
MHD-generator component development. Quarterly report, July 1981-September 1981, 9:2574 (R;US)
MHD-generator component development. Quarterly report, October 1981-December 1981, 9:2575 (R;US)
MHD-generator component development. Quarterly report, January 1982-March 1982, 9:2576 (R;US)
MHD-generator component development. Quarterly report, October 1982-December 1982, 9:2579 (R;US)
MHD-generator component development. Quarterly report, July 1982-September 1982, 9:2578 (R;US)
MHD-generator component development. Quarterly report, April 1983-June 1983, 9:2581 (R;US)
MHD-generator component development. Quarterly report, April 1982-June 1982, 9:2577 (R;US)
MHD-generator component development. Quarterly report, January 1983-March 1983, 9:2580 (R;US)
**Performance Testing**
MHD-generator component development. Quarterly report, July 1981-September 1981, 9:2574 (R;US)
MHD-generator component development. Quarterly report, October 1981-December 1981, 9:2575 (R;US)
MHD-generator component development. Quarterly report, January 1982-March 1982, 9:2576 (R;US)
MHD-generator component development. Quarterly report, October 1982-December 1982, 9:2579 (R;US)
MHD-generator component development. Quarterly report, July 1982-September 1982, 9:2578 (R;US)
MHD-generator component development. Quarterly report, April 1983-June 1983, 9:2581 (R;US)
MHD-generator component development. Quarterly report, April 1982-June 1982, 9:2577 (R;US)
MHD-generator component development. Quarterly report, January 1983-March 1983, 9:2580 (R;US)

**MHD GENERATOR AERL MARK VI**
*Oil-fired MHD test facility at Avco Everett Research Laboratory, Massachusetts.*
**MHD Channels**
MHD-generator component development. Quarterly report, January 1982-March 1982, 9:2576 (R;US)
MHD-generator component development. Quarterly report, October 1982-December 1982, 9:2579 (R;US)
MHD-generator component development. Quarterly report, July 1982-September 1982, 9:2578 (R;US)
MHD-generator component development. Quarterly report, April 1983-June 1983, 9:2581 (R;US)
MHD-generator component development. Quarterly report, January 1983-March 1983, 9:2580 (R;US)

**MHD GENERATOR CDIF**
*Coal-fired Component Development and Integration Facility at Butte, Montana.*
**MHD Channels**
MHD-generator component development. Quarterly report, July 1981-September 1981, 9:2574 (R;US)
MHD-generator component development. Quarterly report, October 1981-December 1981, 9:2575 (R;US)
MHD-generator component development. Quarterly report, January 1982-March 1982, 9:2576 (R;US)
MHD-generator component development. Quarterly report, October 1982-December 1982, 9:2579 (R;US)
MHD-generator component development. Quarterly report, July 1982-September 1982, 9:2578 (R;US)
MHD-generator component development. Quarterly report, April 1983-June 1983, 9:2581 (R;US)
MHD-generator component development. Quarterly report, April 1982-June 1982, 9:2577 (R;US)
MHD-generator component development. Quarterly report, January 1983-March 1983, 9:2580 (R;US)

**MHD GENERATORS**
*See also COAL-FIRED MHD GENERATORS*
*MHD GENERATOR AERL MARK VI*

**Air Heaters**
MHD air heater technology development. Technical progress report, October 1, 1982-September 30, 1983, 9:2573 (R;US)
**MICELLAR SYSTEMS**
**Photochemistry**
Direct observation of radical-pair interaction and decay in anionic micelles. A time-resolved electron-spin-echo study, 9:3014 (J;US)
**MICELLAR-POLYMER FLOODING**
*See MICROEMULSION FLOODING*
**MICROBIAL FLORA**
*See MICROORGANISMS*
**MICROBIAL PROCESSES**
*See FERMENTATION*
**MICROCOMPUTERS**
*See MICROPROCESSORS*
**MICROELECTRONICS**
**Radiation Effects**
Microcircuit radiation effects databank, 9:3202 (R;US)
**MICROEMULSION FLOODING**
**Bench-Scale Experiments**
Treatment fluids to improve sea water injection, 9:1841 (BA;GB)
**MICROFLORA**
*See MICROORGANISMS*
**MICROORGANISMS**
*See also VIRUSES*
*YEASTS*
**Biological Adaptation**
Adaptation of natural microbial communities to degradation of xenobiotic compounds: effects of concentration, exposure time, inoculum, and chemical structure, 9:3379 (J;US)
**Pathogenesis**
Legionella oakridgensis: unusual new species isolated from cooling tower water, 9:3380 (J;US)
**Species Diversity**
Legionella oakridgensis: unusual new species isolated from cooling tower water, 9:3380 (J;US)
**MICROPROCESSORS**
**Physical Radiation Effects**
Radiation effects on the reliabiliaty of microprocessors and associated circuits, 9:3201 (R;FR;In French)
**Uses**
Engineering work stations in the national laboratory, 9:4247 (R;US)
**MICROWAVE RADIATION**
**Biological Effects**
Biological effects of millimeter-wave irradiation. Final report 15 May 81-30 Jun 82, 9:3423 (R;US)
Influence of chronic exposure to low level pulsed microwave radiation on performance and cognitive behavior. Final report, 9:3424 (R;US)
**MIGRATION (RADIONUCLIDE)**
*See RADIONUCLIDE MIGRATION*
**MILITARY FACILITIES**
**Geothermal Resources**
Geothermal potential of Marine Corps Mountain Warfare Training Center at Pickel Meadow, California. Technical memo, 9:2149 (R;US)
**MILK SUGAR**
*See LACTOSE*
**MINE-MOUTH GENERATING PLANTS**
*See FOSSIL-FUEL POWER PLANTS*
**MINERAL ACIDS**
*See INORGANIC ACIDS*
**MINERAL OILS**
**Purification**
Pilot-plant studies for solvent extraction of polychlorinated biphenyl (PCB), 9:3106 (R;US)
**MINERAL WASTES**
**Physical Properties**
Physical property data on coarse anthracite waste. Report of investigations, 9:1795 (R;US)
**Underground Disposal**
Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82, 9:1793 (R;US)
**Waste Product Utilization**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)
**MINING**
*See also COAL MINING*
*OIL SHALE MINING*
*UNDERGROUND MINING*
**Waste Disposal**
Mine waste location by satellite imagery. Open file report 30 May 80-18 Dec 82, 9:1794 (R;US)
**MIRRORS**
**Coatings**
Polymeric glazings, 9:2143 (R;US)
**Reflectivity**
Polymeric glazings, 9:2143 (R;US)
**MISGURNUS**
*See FISHES*
**MIXED CARBIDE FUELS**
**Damaging Neutron Fluence**
Transient failure prediction for carbide TREAT test HC-3, 9:2252 (J;US)
**Fuel Element Failure**
Transient failure prediction for carbide TREAT test HC-3, 9:2252 (J;US)
**Performance Testing**
Transient failure prediction for carbide TREAT test HC-3, 9:2252 (J;US)
**MIXED OXIDE FUELS**
*Uranium dioxide mixed with other oxides.*
**Fission Product Release**
Performance of high plutonium weight fraction mixed-oxide fuel, 9:2293 (J;US)
Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2463 (J;US)
**Swelling**
Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2463 (J;US)
**MIXED-FUNCTION OXIDASE SYSTEMS**
*See MIXED-FUNCTION OXIDASES*
**MIXED-FUNCTION OXIDASES**
**Biosynthesis**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**Metabolic Activation**
Pulmonary metabolism of dibenz(a,j)acridine: a carcinogenic heterocyclic aromatic. Technical progress report, September 1, 1982-September 30, 1983, 9:3404 (R;US)
**MODELS (ATOMIC)**
*See ATOMIC MODELS*
**MODELS (COSMOLOGICAL)**
*See COSMOLOGICAL MODELS*
**MODELS (MATHEMATICAL)**
*See MATHEMATICAL MODELS*
**MODELS (OPTICAL)**
*See OPTICAL MODELS*
**MODELS (PLASMA)**
*See PLASMA SIMULATION*
**MODELS (SHELL)**
*See SHELL MODELS*
**MODELS (STAR)**
*See STAR MODELS*
**MODERATORS**
*See also descriptors for specific moderator materials.*
**Heat Sinks**
Improvement of the CANDU power cycle by moderator heat recovery, 9:2262 (RA;CA)
**MOESSBAUER EFFECT**
**Resolution**
Multiwire proportional chamber for Moessbauer studies of surfaces, 9:3171 (RA;BR;In Portuguese)
**MOLECULAR ORBITAL MODEL**
*See ATOMIC MODELS*
*MOLECULES*

**MOLECULE COLLISIONS**
*See also ATOM-MOLECULE COLLISIONS*
*ELECTRON-MOLECULE COLLISIONS*
*ION-MOLECULE COLLISIONS*
*MOLECULE-MOLECULE COLLISIONS*
**Inelastic Scattering**
Exact scattering solutions in an energy sudden (ES) representation, 9:3569 (J;US)
**Sudden Approximation**
Exact scattering solutions in an energy sudden (ES) representation, 9:3569 (J;US)
**MOLECULE-MOLECULE COLLISIONS**
**Sudden Approximation**
Validity of the energy sudden approximation, 9:3587 (J;US)
**MOLECULES**
*See also POLYATOMIC MOLECULES*
**Chemisorption**
Single atom and-molecules chemisorption on solid surfaces, 9:3979 (RA;BR;In Portuguese)
**Dipole Moments**
Semiclassical inversion procedure for the dipole-moment function for diatomic molecules, 9:3575 (J;US)
**Energy Absorption**
Chaos in multiple-photon excitation of molecules, 9:3556 (J;US)
**Multi-Photon Processes**
Chaos in multiple-photon excitation of molecules, 9:3556 (J;US)
Chaos in the multiple photon excitation of molecules due to vibration-rotation coupling at lowest order, 9:3544 (J;US)
**Spectra**
Comparison of quantal, classical, and semiclassical behavior at an isolated avoided crossing, 9:3579 (J;US)
**MOLLUSCS**
**Contamination**
Accumulation of sediment-associated viruses in shellfish, 9:3419 (J;US)
**Radionuclide Kinetics**
In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant, 9:3286 (R;FR;In French)
**MOLTEN CARBONATE FUEL CELLS**
*Prior to June 1980 this information was indexed with the descriptors HIGH-TEMPERATURE FUEL CELLS + MOLTEN SALTS + CARBONATES.*
**Matrix Materials**
Porous electrolyte retainer for molten carbonate fuel cell, 9:2586 (P;US)
**MOLTEN METAL-WATER REACTIONS**
**Heat Transfer**
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Hydraulics**
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**Test Facilities**
Core melt/coolant interactions: experiments (PWR; BWR), 9:2446 (R;US)
**MOLTEN SALT FUELED REACTORS**
**Neutron Spectra**
Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core, 9:2319 (R;SU;In Russian)
**MOLYBDATES**
*Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.*
**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**MOLYBDENUM**
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electronic Structure**
Renormalization of the H-point phonon anomaly in molybdenum, 9:2715 (J;US)
**Electron-Phonon Coupling**
Renormalization of the H-point phonon anomaly in molybdenum, 9:2715 (J;US)
**Physical Radiation Effects**
Blistering due to neutral He particle bombardment in refractory metals, 9:4175 (RA;JP;In Japanese)
Ion irradiation damage of metals, 9:4173 (RA;JP;In Japanese)
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4165 (RA;JP;In Japanese)
**Sputtering**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**Sulfidation**
In situ laser Raman spectroscopy of the sulfiding of Mo/$\gamma$-$Al_2O_3$ catalysts, 9:2945 (J;US)
**Superlattices**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**MOLYBDENUM ALLOYS**
*See also ALLOY-A-286*
*STAINLESS STEEL-316*
**Electron Diffraction**
Determination of symmetry changes in ordered alloys by convergent beam electron diffraction (Ni-Al-Ta; Ni-Al-Mo), 9:2748 (BA;US)
**Thermal Diffusivity**
Thermal diffusivities of molybdenum/alumina cermets, 9:2794 (J;US)
**MOLYBDENUM COMPLEXES**
**Absorption Spectra**
Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices, 9:3584 (J;US)
**Catalytic Effects**
Homogeneous hydrogenolysis of carbon disulfide catalyzed by a molybdenum dimer with sulfido ligands, 9:2937 (J;US)
**Dissociation**
Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices, 9:3584 (J;US)
**Electrochemistry**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Molecular Structure**
Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices, 9:3584 (J;US)
Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2939 (J;US)
**Photochemistry**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Spectroscopy**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Structural Chemical Analysis**
Iron and molybdenum extended X-ray absorption fine structure studies of double-cubane clusters containing $MoFe_3S_4$ cores, 9:2936 (J;US)
**Synthesis**
Photochemical formation and dissociation of molybdenum—dinitrogen complexes in krypton matrices, 9:3584 (J;US)
**MOLYBDENUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)

**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**S States**
Revised $3p^6 3d^8\ ^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3560 (J;US)
**MOLYBDENUM OXIDES**
**Catalytic Effects**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**MONITORS (AIR POLLUTION)**
*See AIR POLLUTION MONITORS*
**MONITORS (BEAM)**
*See BEAM MONITORS*
**MONOCRYSTALS**
**Channeling**
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Ion-Atom Collisions**
Quantum calculation of heavy-particle backscattering by thin single crystals, 9:3507 (R;AU)
**MOS TRANSISTORS**
*Metal Oxide Silicon transistors.*
**Fabrication**
Wafer-scale laser pantography: Fabrication of n-metal-oxide-semiconductor transistors and small-scale integrated circuits by direct-write laser-induced pyrolytic reactions, 9:3103 (J;US)
**MOSSES**
**Chemical Analysis**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
**MOTION DETECTION SYSTEMS**
**Design**
Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material, 9:2057 (J;US)
**Modifications**
Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material, 9:2057 (J;US)
**Reliability**
Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material, 9:2057 (J;US)
**MULTILEVEL ANALYSIS**
**T Codes**
TIMS-PGG: a code system for producing group constants in fast neutron energy region, 9:2323 (R;JP;In Japanese)
**MULTIPARTICLE SPECTROMETERS**
**Gating Circuits**
Multiparticle event selection with neutral strange particle production. The electronic system of the RISK spectrometer, 9:3179 (R;SU;In Russian)
**MULTIPLE PRODUCTION**
**Regge Poles**
Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3734 (R;US)
**MULTISPECTRAL SCANNERS**
**Design**
Vacuum predisperser for a large plane-grating spectrograph, 9:3221 (BA;US)
**Gratings**
Vacuum predisperser for a large plane-grating spectrograph, 9:3221 (BA;US)
**MULTIWIRE DRIFT CHAMBERS**
*See DRIFT CHAMBERS*
**MULTIWIRE PROPORTIONAL CHAMBERS**
*See also DRIFT CHAMBERS*
**Accuracy**
Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3182 (R;SU;In Russian)
**Fabrication**
Multiwire proportional chamber for Moessbauer studies of surfaces, 9:3171 (RA;BR;In Portuguese)
**Position Sensitive Detectors**
Multiwire proportional low-pressure chamber with a high gas gain coefficient, 9:3185 (R;SU;In Russian)
**Power Supplies**
Stabilized high voltage power supply of proportional and drift chambers, 9:3177 (R;SU;In Russian)
**Readout Systems**
Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3182 (R;SU;In Russian)
**Specifications**
Multiwire proportional low-pressure chamber with a high gas gain coefficient, 9:3185 (R;SU;In Russian)
**MUNICH RESEARCH REACTOR**
*See FRM REACTOR*
**MUNICIPAL BUILDINGS**
*See PUBLIC BUILDINGS*
**MUON ANTINEUTRINOS**
**Particle Production**
Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3727 (J;US)
**MUON BEAMS**
**Beam Production**
Muon storage ring for LAMPF II, 9:3161 (RA;US)
**MUON NEUTRINOS**
*See also MUON ANTINEUTRINOS*
**Oscillations**
Search for neutrino oscillations: present experimental data and future experiments, 9:3625 (RA;SU)
**Particle Production**
Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3727 (J;US)
**MUON PROBES**
Solid-state physics and chemistry (LAMPF II experiment planning), 9:3534 (RA;US)
Studies of magnetic phase transitions with muons (LAMPF II experiment planning), 9:2704 (RA;US)
**MUON REACTIONS**
**Capture**
Muon capture in nuclei, 9:3864 (RA;US)
Muon capture (LAMPF II experiment planning), 9:3700 (RA;US)
Nuclear physics studies with muons, 9:3904 (RA;US)
Nuclear physics experiments using muons, 9:3865 (RA;US)
**Fission**
Muon-induced fission, 9:3933 (RA;US)
Nuclear physics studies with muons, 9:3904 (RA;US)
Nuclear physics experiments using muons, 9:3865 (RA;US)
Study of fission dynamics by muon-induced fission, 9:3932 (RA;US)
**MUONIC ATOMS**
Muon capture from the triplet hyperfine level in hydrogen (LAMPF II experiment planning), 9:3705 (RA;US)
Rare processes ($\mu p + Z \rightarrow e^- + Z$ and $\mu^+ e^- \rightarrow \mu^- e^+$), 9:3702 (RA;US)
**X-Ray Spectra**
Nuclear physics experiments using muons, 9:3865 (RA;US)
**MUONIC MOLECULES**
**Magnetism**
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3532 (R;SU;In Russian)
**Neel Temperature**
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3532 (R;SU;In Russian)
**Spin Orientation**
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3532 (R;SU;In Russian)
**MUONIUM**
Rare processes ($\mu^- + Z \rightarrow e^- + Z$ and $\mu^+ e^- \rightarrow \mu^- e^+$), 9:3702 (RA;US)
**Chemical Reactions**
Solid-state physics and chemistry (LAMPF II experiment planning), 9:3534 (RA;US)
**Hyperfine Structure**
Muonium (LAMPF II experiment planning), 9:3533 (RA;US)

Present state of quantum electrodynamics, 9:3830 (RA;SU;In Russian)
**Production**
Muonium (LAMPF II experiment planning), 9:3533 (RA;US)
**MUON-NUCLEON INTERACTIONS**
*See also MUON-PROTON INTERACTIONS*
**Deep Inelastic Scattering**
Electroweak asymmetry in deep inelastic muon-nucleon scattering, 9:3629 (R;SU)
**MUON-PROTON INTERACTIONS**
**Capture**
μ-capture in a liquid hydrogen, 9:3633 (R;SU;In Russian)
Muon capture from the triplet hyperfine level in hydrogen (LAMPF II experiment planning), 9:3705 (RA;US)
**MUONS**
*See also MUONS PLUS*
**Gyromagnetic Ratio**
Present state of quantum electrodynamics, 9:3830 (RA;SU;In Russian)
**Leptonic Decay**
Test of time-reversal symmetry and V-A structure of muon decay (LAMPF II experiment planning), 9:3704 (RA;US)
**Magnetic Moments**
Muon g/sub μ/-2 experiment (LAMPF II experiment planning), 9:3703 (RA;US)
**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)
**Particle Properties**
Fundamental symmetries and interactions using muons (LAMPF II experiment planning), 9:3699 (RA;US)
**Spatial Dose Distributions**
Recent muon fluence measurements at Fermilab, 9:3966 (J;GB)
**Weak Particle Decay**
Fundamental symmetries and interactions using muons (LAMPF II experiment planning), 9:3699 (RA;US)
Rare muon decay (LAMPF II experiment planning), 9:3701 (RA;US)
**MUONS PLUS**
**Channeling**
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Leptonic Decay**
Search for right-handed currents in muon decay, 9:3729 (J;US)
**MUSCLES**
**Radioactivity**
Iodine-129 in muscle of waterfowl using the test reactor area radioactive leaching ponds in southeastern Idaho, 9:3328 (RA;US)
**Radionuclide Kinetics**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**MUSCULAR TISSUE**
*See MUSCLES*
*TISSUES*
**MWPC**
*See MULTIWIRE PROPORTIONAL CHAMBERS*
**MYOGLOBIN**
**Absorption Spectroscopy**
100-microsecond-resolved EXAFS technique for studying protein dynamics, 9:3212 (J;US)
**NMR Spectra**
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)
**Spin-Lattice Relaxation**
Nuclear magnetic resonance studies of amino acids and proteins. Side-chain mobility of methionine in the crystalline amonio acid and in crystallne sperm whale (Physeter catodon) myoglobin, 9:3347 (J;US)
**MYOMETRIUM**
*See UTERUS*

# N

**NAI DETECTORS**
**Gamma Spectroscopy**
Gamma ray energy loss spectra simulation in NaI detectors with the Monte Carlo method, 9:3200 (B;BR;In Portuguese)
**Photodiodes**
Linearity and resolution of photodiodes, 9:3194 (R;US)
**NAL SYNCHROTRON**
*See FERMILAB ACCELERATOR*
**NAPHTHALENE**
**Hydrogenation**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)
**Solvent Properties**
Dissolution of coal in solvents, 9:1777 (D;US)
**Structural Chemical Analysis**
Variations in mechanism for photoinduced valence isomerizaation of an electron-donor nonconjugated diene, 9:3018 (J;US)
**NAPHTHENES**
*See CYCLOALKANES*
**NAPHTHOLS**
**Solvent Properties**
Dissolution of coal in solvents, 9:1777 (D;US)
**NAPHTHOLS-ALPHA**
*See NAPHTHOLS*
**NAPHTHOLS-BETA**
*See NAPHTHOLS*
**NASA**
**Allocations**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**Budgets**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**Information Systems**
Energy. A continuing bibliography with indexes, issue 36, January 1983, 9:4256 (R;US)
**NATIONAL ACCELERATOR LABORATORY**
*See FERMILAB ACCELERATOR*
**NATIONAL AERONAUTICS AND SPACE ADMINISTRA**
*See NASA*
**NATIONAL GOVERNMENT**
*Use only when needed in conjunction with one or both of the terms LOCAL GOVERNMENT and STATE GOVERNMENT.*
**Budgets**
Changing energy research priorities, 9:2541 (R;US)
**NATIONAL ORGANIZATIONS**
*See also GERMAN FR ORGANIZATIONS*
*SPANISH ORGANIZATIONS*
**Government Policies**
Act No. 2690 concerning the Turkish Atomic Energy Association, 9:4268 (R;TR;In Turkish)
**Organizing**
Act No. 2690 concerning the Turkish Atomic Energy Association, 9:4268 (R;TR;In Turkish)
**NATIONAL REACTOR TESTING STATION**
*See IDAHO NATIONAL ENGINEERING LABORATORY*
**NATIONAL REACTOR TESTING STATION BURST FA**
*See PBF REACTOR*
**NATIONAL SCIENCE FOUNDATION**
**Allocations**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**Budgets**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**NATURAL CIRCULATION**
*See NATURAL CONVECTION*

**NATURAL CONVECTION**
Effects of surface roughness of horizontal cylinders on heat transfer to air under conditions of natural convection, 9:3085 (TJ;US)

**NATURAL DRAFT COOLING TOWERS**
**Heat Exchangers**
Heat technological investigations on plastic heat exchangers for dry type natural draught cooling towers, 9:2188 (R;DE;In German)

**NATURAL GAS**
*See also LIQUEFIED NATURAL GAS*
**Consumption Rates**
State and local responses to natural gas price increases, 9:2553 (R;US)
**Economic Elasticity**
State and local responses to natural gas price increases, 9:2553 (R;US)
**Energy Policy**
Structure and trends in natural gas wellhead contracts, 9:1876 (R;US)
**Energy Supplies**
Issues facing the future use of Alaskan NorthSlope natural gas, 9:1892 (R;US)
**Enhanced Recovery**
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1821 (R;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)
**Exploration**
Opportunity to increase oil and gas exploration and lease rental income, 9:1855 (R;US)
**Fuel Consumption**
Assessment of research opportunities for advanced gas-fired systems in agriculture. Final report Feb 82-Jun 83, 9:1878 (R;US)
**Land Leasing**
Opportunity to increase oil and gas exploration and lease rental income, 9:1855 (R;US)
**Leak Detectors**
BAGI: a new concept for the detection and tracking of hazardous gases, 9:1881 (R;US)
**Maritime Transport**
Castoro Sei introduces new standards of reliability and efficiency in pipelaying, 9:1895 (BA;GB)
Design and testing of a flexible line suitable for gas transportation, 9:1894 (BA;GB)
**Meetings**
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)
**Origin**
Analysis of gases in the earth's crust. Annual report 1 Jan 82-31 Dec 82, 9:1870 (R;US)
**Storage**
Red Lake Salt Cavern gas storage project, Mohave County, Arizona, 9:1900 (J;US)
**Transport**
Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding, 9:1893 (BA;GB)

**NATURAL GAS DEPOSITS**
*See also NATURAL GAS FIELDS*
**Exploitation**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
Utilization of marginal offshore gas deposits by means of mobile offshore power stations, 9:1898 (BA;GB)
**Exploration**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
Tight gas sands evaluation and technology development. Final report Jan 79-Nov 82, 9:1889 (R;US)
**Forecasting**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)
**Geophysical Surveys**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
**Hydraulic Fracturing**
Status of technology associated with hydraulic fracture modeling, 9:1886 (RA;US)
Unconventional-gas-recovery simulation workshop: technical proceedings, 9:1882 (R;US)
**Offshore Sites**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
Utilization of marginal offshore gas deposits by means of mobile offshore power stations, 9:1898 (BA;GB)
**Reservoir Rock**
Some geological modeling aspects of reservoir simulation, 9:1867 (RA;US)
**Resource Assessment**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)
**Seismic Surveys**
Attempt to control the frequency spectrum transmitted during the implosion generated by a steam gun in offshore seismics (VAPORCHOC), 9:1815 (BA;GB)

**NATURAL GAS FIELDS**
**Engineering**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Engineering Geology**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Evaluation**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Geological Surveys**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Production**
Tight gas sands evaluation and technology development. Final report Jan 79-Nov 82, 9:1889 (R;US)

**NATURAL GAS INDUSTRY**
**Exploration**
DEMINEX activities 1980, 9:2558 (R;DE;In German)
**Occupational Safety**
Mines Safety and Health Commission for the mining and other extractive industries. Its role in oil and gas exploration and extraction, 9:1847 (BA;GB)
**Production**
DEMINEX activities 1980, 9:2558 (R;DE;In German)

**NATURAL GAS WELLS**
**Blowouts**
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**Explosive Fracturing**
High-energy gas-fracturing development. Quarterly report, July 1983-September 1983, 9:1891 (R;US)
**Offshore Drilling**
Deep sea drilling: extension of the dynamic positioning capacity by means of the long base, 9:1825 (BA;GB)
**Offshore Platforms**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report, 9:1822 (R;US)
**Offshore Sites**
Automated underwater wellhead, 9:1839 (BA;GB)
Safety problems in connection with offshore process plants, using, as example, a methanol production plant for gas fields, 9:1875 (BA;GB)
**Performance**
Performance of wells in naturally fractured reservoirs, 9:1872 (RA;US)

**Production**
Field and laboratory support for the coproduction of gas and water program. Annual report 1 Apr 82-31 Mar 83, 9:1873 (R;US)
Simulation of Devonian shale infill drilling, 9:1888 (RA;US)
**Well Stimulation**
Simulation of Devonian shale infill drilling, 9:1888 (RA;US)
**Wellheads**
Automated underwater wellhead, 9:1839 (BA;GB)

**NATURE RESERVES**
**Environmental Policy**
Opportunity to increase oil and gas exploration and lease rental income, 9:1855 (R;US)

**NAVIER-STOKES EQUATION**
*See NAVIER-STOKES EQUATIONS*

**NAVIER-STOKES EQUATIONS**
**Asymptotic Solutions**
New representation of Navier-Stokes equations governing self-similar homogeneous turbulence, 9:3605 (J;US)

**NCSCR-1 REACTOR**
**Reactor Decommissioning**
Evaluation of nuclear facility decommissioning projects. Summary report: North Carolina State University Research and Training Reactor, 9:2388 (R;US)
**Reactor Dismantling**
Evaluation of nuclear facility decommissioning projects. Summary report: North Carolina State University Research and Training Reactor, 9:2388 (R;US)

**NEGATIVE IONS**
*See ANIONS*

**NEGATONS**
*See ELECTRONS*

**NEGATRONS**
*See ELECTRONS*

**NEODYMIUM CHLORIDES**
**Hydration**
Hydration of the $Nd^{3+}$ ion in neodymium chloride solutions determined by neutron diffraction, 9:2934 (J;US)

**NEODYMIUM COMPOUNDS**
*See also NEODYMIUM CHLORIDES*
**Hydration**
Hydration of the $Nd^{3+}$ ion in neodymium chloride solutions determined by neutron diffraction, 9:2934 (J;US)

**NEODYMIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)

**NEODYMIUM LASERS**
**Capacitors**
Design and construction of large capacitor banks, 9:4189 (R;US)
**Harmonics**
Large aperture harmonic conversion experiments at Lawrence Livermore National Laboratory, 9:4226 (J;US)
**Slabs**
Improved solid-state laser sources. Final technical report, 2 June 1981-1 June 1982, 9:3078 (R;US)

**NEON**
**Adsorption**
Thermodynamic analysis of the adosrbed Ne in exfoliated graphite, 9:3523 (RA;BR;In Portuguese)
**Electron Sources**
Novel short-pulse photoionization electron source: Li (1s2s2p) $^4P^0$ deexcitation measurements in a plasma, 9:3565 (J;US)
**Ion-Atom Collisions**
Electron detachment for $H^-$ ($D^-$) in collisions with Ne, 9:3549 (J;US)
**Specific Heat**
Thermodynamic analysis of the adosrbed Ne in exfoliated graphite, 9:3523 (RA;BR;In Portuguese)

**NEON 20 REACTIONS**
**Deep Inelastic Scattering**
Fusion and peripheral processes in the collisions of $^{20}Ne+$ $^{20}Ne$ and $^{20}Ne+$ $^{16}O$, 9:3881 (J;US)
**Fusion Reactions**
Fusion and peripheral processes in the collisions of $^{20}Ne+$ $^{20}Ne$ and $^{20}Ne+$ $^{16}O$, 9:3881 (J;US)
**Peripheral Models**
$^{20}Ne$ induced peripheral reaction at 30 MeV/nucleon, 9:3869 (R;FR)
**Quasi-Elastic Scattering**
Fusion and peripheral processes in the collisions of $^{20}Ne+$ $^{20}Ne$ and $^{20}Ne+$ $^{16}O$, 9:3881 (J;US)

**NEON 20 TARGET**
**Neon 20 Reactions**
Fusion and peripheral processes in the collisions of $^{20}Ne+$ $^{20}Ne$ and $^{20}Ne+$ $^{16}O$, 9:3881 (J;US)

**NEON IONS**
**Ion-Atom Collisions**
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3509 (R;US)

**NEOPENTANE**
*See 2-2-DIMETHYLPROPANE*

**NEOPLASMS**
*See also CARCINOMAS*
*LEUKEMIA*
*MELANOMAS*
**Diagnosis**
Computer tomography of abdominal tumours, 9:3360 (RA;HU;In Hungarian, English)
**Neutron Therapy**
Results of a pilot-study on neutron-therapy with 600 patients, a condensed report, 9:3369 (RA;HU;In Hungarian, English)
**Radioinduction**
Inhalation carcinogenesis of high fired $^{241}AmO_2$ in rats, 9:3399 (J;US)
**Radiotherapy**
Radiation therapy plan for Regional Health Planning Council, Newark, New Jersey, 1980. New Jersey Health Service Area 2, 9:3352 (R;US)

**NEPTUNIUM**
**Adsorption**
Batch method of measuring sorption ratios, 9:3287 (R;US)

**NEPTUNIUM 235**
**Intestinal Absorption**
The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3397 (J;US)

**NEPTUNIUM 239**
**Intestinal Absorption**
The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3397 (J;US)

**NEPTUNIUM COMPOUNDS**
**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)

**NETHERLANDS**
**Radiation Protection Laws**
Stb No. 501 - Decree of 24 June 1981 to amend the Radioactive Materials Decree made under the Nuclear Energy Act, 9:4266 (R;NL;In Dutch)
Stb No. 502 - Decree of 24 June 1981 to amend the Devices Decree made under the Nuclear Energy Act, 9:4267 (R;NL;In Dutch)

**NETWORK ANALYSIS**
**Algorithms**
Parametric integer linear programming: a synthesis of branch and bound with cutting planes, 9:4251 (J;NL)

**NEUTRAL BEAM SOURCES**
**Beam Neutralization**
Photodetachment technology, 9:4193 (R;US)

**NEUTRAL-CURRENT INTERACTIONS**
**Weinberg Lepton Model**
Neutral current weak interaction without electroweak unification, 9:3790 (R;XA)

**NEUTRALIZATION (BEAM)**
*See BEAM NEUTRALIZATION*

**NEUTRETTOS**
*See MUON NEUTRINOS*

**NEUTRINO BEAMS**
**Beam Production**
Neutrino beams at LAMPF II, 9:3148 (RA;US)
Possible neutrino beams, fluxes, and rates at LAMPF II, 9:3147 (RA;US)
**NEUTRINO DETECTION**
Search for neutrino oscillations: present experimental data and future experiments, 9:3625 (RA;SU)
**Liquid Scintillation Detectors**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)
**NEUTRINO REACTIONS**
**Experiment Planning**
Neutrino interactions with nuclei, 9:3675 (RA;US)
Neutrino reactions, 9:3674 (RA;US)
**NEUTRINO-ELECTRON INTERACTIONS**
Neutrino reactions, 9:3674 (RA;US)
**Elastic Scattering**
Neutrino-electron elastic scattering, 9:3677 (RA;US)
Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3678 (RA;US)
**Experiment Planning**
Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3678 (RA;US)
**NEUTRINO-NEUTRINO INTERACTIONS**
**Cosmology**
Role of interaction in neutrino statistics. In memory of Bronislaw Kuchowicz, 9:3743 (R;XA)
**NEUTRINO-NUCLEON INTERACTIONS**
*See also ANTINEUTRINO-NUCLEON INTERACTIONS*
*NEUTRINO-PROTON INTERACTIONS*
**Charged-Current Interactions**
Measurement of the $\nu$/sub $\mu$/ charged-current cross section, 9:3725 (J;US)
**Deep Inelastic Scattering**
Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3794 (R;XA)
**Particle Production**
Experimental study of like-sign dimuons and of trimuons events produced in high energy neutrino and antineutrino interactions, 9:3732 (R;FR;In French)
**Polarized Targets**
Spin-spin asymmetries with $\nu$ and $\nu$-bar beams and polarized nucleons, 9:3794 (R;XA)
**NEUTRINO-PROTON INTERACTIONS**
**Elastic Scattering**
Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3678 (RA;US)
**Experiment Planning**
Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3678 (RA;US)
Possibility of observing nu p elastic scattering in a hydrogen bubble chamber at LAMPF II, 9:3676 (RA;US)
**NEUTRINOS**
*See also COSMIC NEUTRINOS*
*ELECTRON NEUTRINOS*
*MUON NEUTRINOS*
*SOLAR NEUTRINOS*
*TAU NEUTRINOS*
**Mass**
No-neutrino double beta decay: more than one neutrino, 9:3706 (R;US)
**Oscillations**
Muon storage ring for LAMPF II, 9:3161 (RA;US)
Neutrino reactions, 9:3674 (RA;US)
**Particle Production**
Limits to the number of neutrinos: A comment on the $Z^0$ discovery, 9:3781 (J;US)
**Research Programs**
Neutrino oscillations at CERN, 9:3613 (RA;XC)
**Reviews**
Search for massive neutrinos, axions and SUSY particles at CERN SPS energies, 9:3616 (RA;XC)
**Statistics**
Role of interaction in neutrino statistics. In memory of Bronislaw Kuchowicz, 9:3743 (R;XA)
**NEUTRON ABSORBERS**
**Physical Radiation Effects**
Survey of C.E.A. absorber materials development program, 9:2274 (R;FR)
**Standards**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material, 9:3075 (B;US)
**NEUTRON ACTIVATION ANALYSIS**
*See NEUTRON REACTIONS*
**NEUTRON CAPTURE**
*See NEUTRON REACTIONS*
**NEUTRON DETECTION**
**Corona Counters**
Neutron detection channel with a counter based on the SNM-14 corona counter, 9:3178 (R;SU;In Russian)
**Efficiency**
Peak separation from time-of-flight spectra and problems of detector efficiency determination in neutron spectroscopy, 9:3170 (R;XA)
**NEUTRON DIFFRACTOMETERS**
**Containers**
Versatile sample chamber for neutron scattering work at high and low temperatures, 9:3196 (J;US)
**NEUTRON DIFFUSION EQUATION**
**Analytical Solution**
Subnoding technique in the context of the analytic nodal method, 9:2320 (RA;CA)
**NEUTRON DOSIMETRY**
**Comparative Evaluations**
1982 US-CEC neutron personnel dosimetry intercomparison study, 9:3974 (R;US)
**Dosemeters**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Measuring Instruments**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**NEUTRON ECONOMY**
*See NEUTRON FLUX*
**NEUTRON FLUX**
*See also ADJOINT FLUX*
**Computerized Simulation**
High order method in flux mapping, 9:2261 (RA;CA)
**NEUTRON FLUX DENSITY**
*See NEUTRON FLUX*
**NEUTRON LIFETIME LOG**
*See NEUTRON-NEUTRON LOGGING*
**NEUTRON MATTER**
*See NUCLEAR MATTER*
**NEUTRON REACTIONS**
**Capture**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
JNDC nuclear data library of fission products, 9:3909 (R;JP)
Neutron capture rates in the r-process: the role of direct radiative capture[1], 9:3479 (J;US)
Weak nucleon-nucleon interaction in few body systems, 9:3861 (R;FR)
**Cross Sections**
Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3946 (R;JP)
Measurement of the /SUP 242m/ Am neutron fission cross section, 9:3936 (J;US)
Neutron-induced gamma-ray production in $^{57}$Fe for incident neutron energies between 0.16 and 21 MeV, 9:3892 (J;US)
**Fission**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
Measurement of the /SUP 242m/ Am neutron fission cross section, 9:3936 (J;US)
**Inclusive Interactions**
Precompound analyses of $^{59-64}$Ni(n,px) reactions, 9:3888 (J;US)

**Nuclear Data Collections**
Comparisons of energy dependent point-wise cross-section generation codes: RESEND, RESENDD, RECENT, 9:3946 (R;JP)
**Particle Production**
Charmed baryon Asub(c)sup(+) production by approximately 58 GeV neutrons on carbon, 9:3628 (R;SU)
**Precompound-Nucleus Emission**
Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3888 (J;US)
**Quasi-Elastic Scattering**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**Spallation**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)

**NEUTRON SOURCES**
*Excludes reactors even when used as neutron sources.*
**Design**
Factors affecting the operating characteristic of the zetatron: a small neutron generator for borehole logging, 9:3124 (J;US)
**Fabrication**
Transuranium-element processing, 9:3037 (RA;US)
**Neutron Emission**
Calculation of the ORELA neutron moderator spectrum and resolution function, 9:3156 (J;NL)
**Radiation Protection**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)

**NEUTRON SPECTRA**
**A Codes**
APPLE-2: an improved version of APPLE code for plotting neutron and gamma ray spectra and reaction rates, 9:3176 (R;JP)
**Spectra Unfolding**
Neutron spectra unfolding from measured detector activations, 9:3186 (R;DE;In German)
Peak separation from time-of-flight spectra and problems of detector efficiency determination in neutron spectroscopy, 9:3170 (R;XA)

**NEUTRON SPECTROMETERS**
**Background Radiation**
Measuring background by the DIN-1M spectrometer using the oscillating absorbing screen method, 9:3167 (R;SU;In Russian)

**NEUTRON STARS**
**Cosmic X-Ray Bursts**
Joint timing analysis of A0535 + 26 at 1980 outburst, 9:3447 (R;US)
**Gamma Spectra**
Comparison of photon-photon and photon-magnetic field pair production rates, 9:3458 (R;US)
**Phase Transformations**
Phase transitions in nuclear matter and consequences for neutron stars, 9:3949 (R;DD)
**Star Accretion**
Gamma-burst emission from neutron-star accretion, 9:3446 (R;US)

**NEUTRON THERAPY**
**Comparative Evaluations**
Results of a pilot-study on neutron-therapy with 600 patients, a condensed report, 9:3369 (RA;HU;In Hungarian, English)
**Radiation Protection**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)

**NEUTRON TRANSPORT THEORY**
**Comparative Evaluations**
Comparison of neutron transport calculations with NRC test results. Final report, 9:2322 (R;DE;In German)
**Neutron Spectra**
Comparison of neutron transport calculations with NRC test results. Final report, 9:2322 (R;DE;In German)

**NEUTRON-DEFICIENT ISOTOPES**
**Beta Decay**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)

**NEUTRON-NEUTRON LOGGING**
**Data Analysis**
Computer codes for PFN and multi-element log analysis, 9:1908 (R;US)

**NEUTRON-RICH ISOTOPES**
**Isotope Production**
Nuclei far from stability produced by high-energy protons, 9:3895 (RA;US)
**Mass Spectroscopy**
Nuclei far from stability produced by high-energy protons, 9:3895 (RA;US)

**NEUTRONS**
*See also FAST NEUTRONS*
**Attenuation**
Investigation of neutron kinetics in the nanosecond range in a depleted uranium sphere, 9:3960 (R;SU;In Russian)
**Dose Rates**
American National Standard: neutron and gamma-ray flux-to-dose rate factors, 9:3977 (B;US)
**Particle Interactions**
Neutron-antineutron oscillations from an experimental point of view, 9:3624 (RA;HU)
**Reactor Kinetics**
Neutron cost criteria for long-term fissile fuel enhancement, 9:2267 (RA;CA)

**NEVADA TEST SITE**
**Air Quality**
Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2045 (R;US)
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2046 (R;US)
**Bibliographies**
Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2045 (R;US)
**Climates**
Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2045 (R;US)
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2046 (R;US)
**Cultural Resources**
Annotated bibliography of cultural resources literature for the Nevada Nuclear Waste Storage Investigations, 9:1989 (R;US)
Cultural resources overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:1988 (R;US)
**Meteorology**
Annotated bibliography for atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2045 (R;US)
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2046 (R;US)
**Noise Pollution**
Atmospheric overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, 9:2046 (R;US)

**NEW HAMPSHIRE**
**Heating Oils**
State Heating Oil Grants Program. Final report, September 1, 1982-May 31, 1983, 9:1850 (R;US)

**NEW JERSEY**
**Radiotherapy**
Radiation therapy plan for Regional Health Planning Council, Newark, New Jersey, 1980. New Jersey Health Service Area 2, 9:3352 (R;US)

**NICKEL**
**Annealing**
Laser annealing of Ni(001), 9:2713 (J;US)

**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Catalytic Effects**
Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2082 (J;US)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Chromatography**
Basic science and technology, 9:1928 (RA;US)
**Curie Point**
Curie temperature in Nickel thin films, 9:2698 (RA;BR;In Spanish)
**Density Matrix**
Metallic surface description in a localized representation, 9:2689 (RA;BR;In Portuguese)
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electron Collisions**
Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3508 (R;US)
**Ion Collisions**
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)
**Irradiation**
The effect of preinjected gas atoms on depth dependent damage in self-ion irradiated nickel, 9:2725 (J;US)
**Microstructure**
Growth and interconnection of pressurized pores in nickel and relation to stress rupture models, 9:2728 (J;US)
**Neon 20 Reactions**
$^{20}$Ne induced peripheral reaction at 30 MeV/nucleon, 9:3869 (R;FR)
**Photoelectron Spectroscopy**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
Ion irradiation damage of metals, 9:4173 (RA;JP;In Japanese)
The effect of preinjected gas atoms on depth dependent damage in self-ion irradiated nickel, 9:2725 (J;US)
**Porosity**
Growth and interconnection of pressurized pores in nickel and relation to stress rupture models, 9:2728 (J;US)
**Positron Collisions**
Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3508 (R;US)
**Powder Metallurgy**
Growth and interconnection of pressurized pores in nickel and relation to stress rupture models, 9:2728 (J;US)
**Sorptive Properties**
Chemisorption of atomic hydrogen in nickel, 9:2690 (RA;BR;In Portuguese)
Coadsorption and reaction of $H_2$ and CO on Raney nickel: neutron vibrational spectroscopy, 9:2082 (J;US)
Decomposition of water adsorbed in iron and nickel films, 9:2692 (RA;BR;In Spanish)
**Surface Treatments**
Laser annealing of Ni(001), 9:2713 (J;US)

**NICKEL 58 TARGET**
**Kaon Plus Reactions**
Tests of the $K^+$-nucleon interaction in nuclei: an inelastic-scattering survey, 9:3873 (RA;US)
**Neutron Reactions**
Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3888 (J;US)
**Nitrogen 14 Reactions**
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)

**NICKEL 60 TARGET**
**Neutron Reactions**
Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3888 (J;US)
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)

**NICKEL 62**
**Energy Levels**
Two-quasiparticle strength distributions in $^{62}$Ni and $^{206}$Pb, 9:3894 (R;SU)

**NICKEL 62 TARGET**
**Neutron Reactions**
Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3888 (J;US)

**NICKEL 64 REACTIONS**
**Fusion Reactions**
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)

**NICKEL 64 TARGET**
**Carbon 14 Reactions**
Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3893 (R;FR)
**Neutron Reactions**
Precompound analyses of $^{58-64}$Ni(n,px) reactions, 9:3888 (J;US)
**Nickel 64 Reactions**
Inversion formula for the internucleus potential using sub-barrier fusion cross sections, 9:3876 (J;US)

**NICKEL ALLOYS**
*See also ALLOY-A-286*
*NICKEL BASE ALLOYS*
*NICKEL STEELS*
**Magnetic Moments**
Magnetic moment distribution in Fe/sub 0.68/ $^{60}$Ni/sub 0.32/, 9:2738 (J;US)
**Metallurgical Effects**
Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying, 9:2708 (J;US)
**Microstructure**
Rapid solidification microstructures in austenitic Fe-Ni alloys, 9:2727 (J;US)
**Oxidation**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)
**Phase Studies**
Phase identification in $TiB_2$Ni composites by analytical electron microscopy, 9:2797 (BA;US)
**Phase Transformations**
Diffusion decay of binary precipitation in "transitional" asymptotic range, 9:2703 (R;SU;In Russian)
**Physical Radiation Effects**
Kinetics of radiation-induced segregation in Ni—12.7 at. % Si, 9:2719 (J;US)
**Segregation**
Kinetics of radiation-induced segregation in Ni—12.7 at. % Si, 9:2719 (J;US)
**Solidification**
Rapid solidification microstructures in austenitic Fe-Ni alloys, 9:2727 (J;US)
**Synthesis**
Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying, 9:2708 (J;US)

**NICKEL BASE ALLOYS**
**Electron Diffraction**
Determination of symmetry changes in ordered alloys by convergent beam electron diffraction (Ni-Al-Ta; Ni-Al-Mo), 9:2748 (BA;US)

**NICKEL COMPLEXES**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
**Catalytic Effects**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**Chemical Bonds**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of $\gamma$(OHO) vs R (OO), 9:3969 (J;US)

**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)
**Neutron Diffraction**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO), 9:3969 (J;US)
**Structural Chemical Analysis**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO), 9:3969 (J;US)

**NICKEL COMPOUNDS**
*See also NICKEL OXIDES*
*NICKEL SULFIDES*
**Catalytic Effects**
Desulfurization with transition metal catalysts, 9:1758 (R;US)

**NICKEL IONS**
**Chemical Reactions**
Nickel ions affect a highly specific 1,4-dehydrogenation of hydrocarbons in the gas phase: metallacycles are not involved, 9:2965 (J;US)

**NICKEL OXIDES**
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
**Dislocations**
Detection of the change in mean inner potential at dislocations in grain boundaries in NiO, 9:2774 (R;US)
**Interatomic Forces**
The influence of covalency on anion-anion interionic potentials in NiO, 9:2791 (J;GB)
**Reduction**
Gaseous reduction of an alloy oxide, 9:2969 (J;GB)

**NICKEL STEELS**
**Welding**
Fusion welding process, 9:2721 (P;US)

**NICKEL SULFIDES**
**Chemical Reaction Yield**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**NICKEL-HYDROGEN BATTERIES**
**Failure Mode Analysis**
Cycle life test and failure model of nickel-hydrogen cells, 9:2521 (R;US)
**Performance Testing**
Cycle life test and failure model of nickel-hydrogen cells, 9:2521 (R;US)
**Technology Assessment**
Cycle life test and failure model of nickel-hydrogen cells, 9:2521 (R;US)

**NICKEL-ZINC BATTERIES**
**Battery Charging**
Rechargeability of the zinc electrode in alkaline electrolyte, 9:2520 (R;US)
**Failure Mode Analysis**
Report for 1981 on research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion, 9:2522 (R;US)
**Performance**
Rechargeability of the zinc electrode in alkaline electrolyte, 9:2520 (R;US)
**Performance Testing**
Report for 1981 on research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion, 9:2522 (R;US)

**NIOBATES**
*Specific compounds should be indexed by coordination of a descriptor in the form (CATION) COMPOUNDS and the above anion descriptor.*
**Luminescence**
Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate, 9:2827 (R;US)

**NIOBIUM**
**Coatings**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Dehydridation**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Electron Diffraction**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Electronic Structure**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Hydridation**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Photoelectron Spectroscopy**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Sputtering**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**Superlattices**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)

**NIOBIUM 95**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)

**NIOBIUM ALLOYS**
*See also INCONEL 600*
*NIOBIUM BASE ALLOYS*
**Critical Field**
Critical-field measurements in Nb-Ti compositon-modulated alloys, 9:2740 (J;US)
**Metallurgical Effects**
Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying, 9:2708 (J;US)
**Physical Radiation Effects**
Preliminary small angle neutron scattering investigations of neutron irradiation produced voids, 9:2770 (BA;US)
**Synthesis**
Preparation of "amorphous" $Ni_{60}Nb_{40}$ by mechanical alloying, 9:2708 (J;US)
**Transition Temperature**
Critical-field measurements in Nb-Ti compositon-modulated alloys, 9:2740 (J;US)

**NIOBIUM ARSENIDES**
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)

**NIOBIUM BASE ALLOYS**
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Physical Radiation Effects**
Low temperature irradiations of iridium and of the compound $Nb_3Ge$ (Neutron irradiation), 9:2672 (R;FR;In French)
**Superconductivity**
Flux pinning in bronze-processed $Nb_3Sn$ wires, 9:2762 (BA;US)

**NIOBIUM HYDRIDES**
**Electronic Structure**
Electronic structure of metal hydrides. VI. Photoemission studies and band theory of VH, NbH, and TaH, 9:2785 (J;US)

**NIOBIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**S States**
Revised $3p^6 3d^8\ {}^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3560 (J;US)

**NIOBIUM SELENIDES**
**Physical Radiation Effects**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves (Electron irradiation), 9:2815 (R;FR;In French)
**NIOBIUM SILICIDES**
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**NITRATES**
*See also PETN*
*THALLIUM NITRATES*
*URANIUM NITRATES*
**Atmospheric Chemistry**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)
**NITRIC ACID**
**Aerosols**
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3258 (R;US)
**NITRIC OXIDE**
*NO.*
**Adsorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface, 9:2910 (R;DE;In German)
**Desorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface, 9:2910 (R;DE;In German)
**Infrared Spectra**
Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$, 9:3585 (J;US)
**Mass Spectra**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Reduction**
Reduction of nitrogen monoxide by catalytically activated lignite coke, 9:1792 (R;DE;In German)
**NITRITES**
*Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.*
**Chemical Reaction Kinetics**
Reaction of nitrite ion with hydroxylamine-N-sulfonate in aqueous solution, 9:2959 (J;US)
**NITRO COMPOUNDS**
*See also NITROBENZENE*
*NITROPHENOL*
*POLYCYCLIC NITRO COMPOUNDS*
**Adsorption**
Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2902 (J;US)
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Fluorescence Spectroscopy**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Photochemical Reactions**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)
**NITROBENZENE**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**NITROGEN**
**Absorption Spectra**
Transition from adiabatic to sudden core-electron excitation: $N_2$ on Ni(100), 9:2857 (J;US)
**Adsorption**
Basic science and technology, 9:1928 (RA;US)
**Condensates**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**Electron Drift**
Electron drift velocities in gas mixtures of He, $N_2$, and $CO_2$, 9:2863 (J;US)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Fine Structure**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**Gas Spills**
LLNL/NWC 1980 LNG spill tests. Burro series data report: the appendices, 9:1879 (R;US)
**Ion Emission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
**Ion Pairs**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Neutron Reactions**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**Nucleation**
Magic numbers for argon and nitrogen cluster ions, 9:3570 (J;US)
**P States**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**Photoemission**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)
Transition from adiabatic to sudden core-electron excitation: $N_2$ on Ni(100), 9:2857 (J;US)
**Radiolysis**
A pulse radiolysis study of the excitation of nitrogen and aromatic hydrocarbons in rare gas-additive mixtures: Evidence for subexcitation electron interactions, 9:3032 (J;US)
**NITROGEN 13**
**Isotope Production**
On-line production of ($^{13}$N)-nitrogen from solid enriched ($^{13}$C)-targets, and its application to ($^{13}$N)-ammonia synthesis using microwave radiation, 9:3044 (J;GB)
**NITROGEN 14**
**Hypernuclei**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**NITROGEN 14 REACTIONS**
**Breakup Reactions**
Projectile break-up of $^{14}$N at 62,7 MeV, 9:3870 (R;FR)
**Compound-Nucleus Reactions**
High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3926 (J;US)
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)

**Rutherford Scattering**
Optical theorem and forward glory effects in heavy-ion scattering, 9:3942 (R;BR)
**NITROGEN 14 TARGET**
**Kaon Minus Reactions**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**NITROGEN 15**
**Isotope Separation**
Stable isotope studies. Annual progress report, March 1, 1983-February 29, 1984, 9:2971 (R;US)
**NITROGEN 15 TARGET**
**Pion Plus Reactions**
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)
**NITROGEN DIOXIDE**
*$NO_2$.*
**Health Hazards**
Respiratory effects of air pollutants, 9:3410 (R;SE;In Swedish)
**Infrared Spectra**
Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$, 9:3585 (J;US)
**NITROGEN IONS**
**Collisions**
Dependence of multiple-scattering distributions on the charge states of fast ions exiting from solid targets, 9:3561 (J;US)
**Ion-Atom Collisions**
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3509 (R;US)
**NITROGEN NITRIDES**
*See NITROGEN*
**NITROGEN OXIDES**
*See also NITRIC OXIDE*
*NITROGEN DIOXIDE*
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3275 (R;US)
**Infrared Spectra**
Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$, 9:3585 (J;US)
**Isomerization**
Infrared absorption spectra of nitrogen oxides in liquid xenon. Isomerization of $N_2O_3$, 9:3585 (J;US)
**NITROPHENOL**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**NMR**
*See NUCLEAR MAGNETIC RESONANCE*
**NMR SPECTRA**
**Spin Echo**
Total spin coherence transfer echo spectroscopy, 9:2899 (J;US)
**NO. 2 FUEL OIL**
*See HEATING OILS*
**NOBELIUM 258**
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)
**NOBLE GASES**
*See RARE GASES*
**NOISE (REACTOR)**
*See REACTOR NOISE*
**NONAXIAL NUCLEI**
*See DEFORMED NUCLEI*
**NONDESTRUCTIVE TESTING**
**Data Analysis**
Maximum entropy reconstruction of a volume anomaly from pulse scatter data, 9:3096 (R;US)
**Meetings**
Review of progress in quantitative NDE, 9:3091 (R;US)
**NONLINEAR PLASMA INSTABILITIES**
*See PARAMETRIC INSTABILITIES*
**NONRADIOACTIVE WASTE DISPOSAL**
*See WASTE DISPOSAL*
**NONRADIOACTIVE WASTES**
*See GASEOUS WASTES*
*SOLID WASTES*
**NORTH CAROLINA**
**Surface Waters**
Effect of effluent from a nitrogen fertilizer factory and a pulp mill on the distribution and abundance of Aeromonas hydrophila in Albemarle Sound, North Carolina, 9:3381 (J;US)
**NORTH CAROLINA STATE COLLEGE RESEARCH REA**
*See NCSCR-1 REACTOR*
**NORTH SEA**
**Offshore Platforms**
Subproject 2: an autonomous, manned, submersible catamaran equipment carrier - the Bruker Subcat, 9:1845 (BA;GB)
**Oil Fields**
Offshore LNG transfer system, 9:1896 (BA;GB)
**NORTHERN IRELAND**
*See UNITED KINGDOM*
**NORWAY**
**Charcoal**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2071 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2072 (R;NO;In Norwegian)
**Energy Supplies**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Greenhouses**
Charcoal based $CO_2$-generator for use in greenhouses, 9:2644 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - possible use, 9:2645 (R;NO;In Norwegian)
Charcoal for warming and $CO_2$-supply in greenhouses - some economical comments, 9:2646 (R;NO;In Norwegian)
$CO_2$- budget in greenhouses with $CO_2$- addition, 9:3260 (R;NO;In Norwegian)
**Solar Energy**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Wave Energy Converters**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Wave Power**
Season variations of wave power in Norway, 9:2178 (R;NO)
**Wind Power**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Wood Wastes**
Charcoal as an alternative energy carrier. Pt.1: Resources, 9:2105 (R;NO;In Norwegian)
**NOTCHES**
**Bending**
Bending elasticity of circularly notched bars as monolithic flexure hinges in precision mechanisms, 9:3054 (TG;US)
**Elasticity**
Bending elasticity of circularly notched bars as monolithic flexure hinges in precision mechanisms, 9:3054 (TG;US)
**NRTS**
*See IDAHO NATIONAL ENGINEERING LABORATORY*
**NRU CANADA REACTOR**
*See NRU REACTOR*
**NRU REACTOR**
**Fuel Elements**
Development of lower enrichment fuels for Canadian research reactors, 9:2357 (RA;US)

**NRX REACTOR**
**Fuel Elements**
Development of lower enrichment fuels for Canadian research reactors, 9:2357 (RA;US)
**NSRR REACTOR**
*Nuclear Safety Research Reactor in Japan.*
**Fuel Element Failure**
Semiannual progress report on the NSRR experiments, (12). January, 1981 to June, 1981, 9:2383 (R;JP;In Japanese)
**NUCLEAR ATTACKS**
*See NUCLEAR WEAPONS*
**NUCLEAR CHEMISTRY**
**Experiment Planning**
Nuclear chemistry, 9:3905 (RA;US)
**NUCLEAR CONTROVERSY**
*See HUMAN POPULATIONS*
**NUCLEAR DATA COLLECTIONS**
Recent References January through April 1983, 9:3859 (J;US)
**NUCLEAR ENERGY**
**Health Hazards**
Nuclear energy an unacceptable hazard to health, 9:2454 (J;GB)
**Occupational Safety**
Nuclear energy an unacceptable hazard to health, 9:2454 (J;GB)
**Public Opinion**
Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing, 9:1935 (B;DE;In German)
**Public Relations**
Report: Reprocessing. Vol. 1. Representation and critical evaluation of technology, safety and the energy-political significance of reprocessing, 9:1935 (B;DE;In German)
**NUCLEAR ENGINEERING**
**Coordinated Research Programs**
Agreement on scientific and technical co-operation in the peaceful uses of nuclear energy between the National Laboratory of Industrial Engineering and Technology (LNETI) and the Commissariat a l'Energie Atomique (CEA), 9:2546 (R;PT;In Portuguese)
**Education**
Training of technicians in the nuclear field: university/industry collaboration, 9:2476 (J;US)
Transfer of educational programs to the nuclear utility industry, 9:2479 (J;US)
**Technology Transfer**
Transfer of educational programs to the nuclear utility industry, 9:2479 (J;US)
**NUCLEAR EXPLOSIONS**
*Specifically named single nuclear explosions are listed by name and the word EVENT, e.g., BOXCAR EVENT. All projects involving nuclear explosions are listed by the project name and the word PROJECT, e.g., PLOWSHARE PROJECT.*
Glass produced by underground nuclear explosions (Rainier), 9:3252 (R;US)
Preliminary nuclear terrorist effects study (Detonation in city street), 9:3250 (RA;US)
**Blast Effects**
Air gun test facility, 9:3235 (RA;US)
**Fires**
Blast/fire interaction experiments (Direct course), 9:3245 (RA;US)
Criteria for onset of firestorms, 9:3230 (RA;US)
Fire in targeting urban/industrial areas, 9:3243 (RA;US)
Firestorm formation and environment characteristics after a large-yield nuclear burst, 9:3229 (RA;US)
Global-scale obscuration by mass fire smoke, 9:3242 (RA;US)
Large urban fire environment: trends and model city predictions, 9:3233 (RA;US)
**Flashover**
Flashover modeling for direct course, 9:3241 (RA;US)
**Plumes**
Some observations on the effect of turbulence modeling in numerical simulations of multiple-burst flow fields, 9:3227 (RA;US)
**Pulses**
Analytic approximations to dynamic pressure and impulse and other fits for nuclear blasts, 9:3247 (RA;US)
**Simulation**
Blast/fire interaction experiments (Direct course), 9:3245 (RA;US)
Design of blast simulators for nuclear testing, 9:3249 (RA;US)
Los Alamos laser simulation of high-altitude nuclear-explosion effects. Final report, 9:3251 (R;US)
**Thermal Radiation**
Thermal radiation from a nuclear weapon burst, 9:3244 (RA;US)
**NUCLEAR FACILITIES**
*See also FUEL REPROCESSING PLANTS*
*IRRADIATION PLANTS*
*NUCLEAR POWER PLANTS*
*RADIOACTIVE WASTE FACILITIES*
**Decommissioning**
The effect of accidents on decommissioning waste management for nuclear fuel cycle and nonfuel cycle facilities, 9:2306 (J;US)
**Inventories**
Semi-annual report on strategic special nuclear material inventory differences, 9:2050 (R;US)
**Legal Aspects**
Nuclear Regulatory Commission Issuances, February 1983. Vol. 17, No. 2, 9:2303 (R;US)
Nuclear Regulatory Commission issuances, January 1983. Vol. 17, No. 1, 9:2302 (R;US)
**Material Unaccounted For**
Semi-annual report on strategic special nuclear material inventory differences, 9:2050 (R;US)
**Radioactive Waste Management**
The effect of accidents on decommissioning waste management for nuclear fuel cycle and nonfuel cycle facilities, 9:2306 (J;US)
Waste management in nuclear facilities. Abstracts, 9:2041 (B;DE)
**Sabotage**
Nuclear facility threat analysis and tactical-response procedures, 9:2467 (B;US)
**Safety Standards**
Decree No. 524 of 8 June 1982 of the President of the Republic implementing CEC. Directive No. 77/576 for standardization of Member States' legislative, regulatory and administrative provisions on safety signs in workplaces and CEC Directive No. 79/640 amending the Annexes of the latter (Euratom), 9:4265 (R;IT;In Italian)
**Security Personnel**
Nuclear facility threat analysis and tactical-response procedures, 9:2467 (B;US)
**Site Surveys**
Determination of concentrations of selected radionuclides in surface soil in the US, 9:3297 (J;GB)
**Waste Management**
Introduction - types and quantitites of nuclear waste - principles of waste management, 9:1960 (R;DE)
Technical, environmental and regulatory aspects of waste management and their reflection in the IAEA programme, 9:1959 (R;DE)
**NUCLEAR FORCES**
**Quantum Chromodynamics**
Quantum chromodynamics in few-nucleon systems, 9:3773 (R;US)
**NUCLEAR FRAGMENTS**
*See also HYPERNUCLEI*
**Mean Free Path**
Z dependence of strongly interacting relativistic nuclear fragments, 9:3915 (J;US)
**NUCLEAR FUEL ELEMENTS**
*See FUEL ELEMENTS*
**NUCLEAR FUELS**
*See also MIXED CARBIDE FUELS*
*SPENT FUELS*
**Thermodynamic Properties**
Thermophysical properties of reactor fuels, 9:1926 (BA;US)

NUCLEAR INDUSTRY
Autoradiography
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)
Fuel Pins
Some unique applications of solid-state track-recorder autoradiography in the nuclear industry, 9:2332 (R;US)
Government Policies
Nuclear industry review. Problems and prospects 1981-2000, 9:2545 (R;CA)
NUCLEAR MAGNETIC RESONANCE
Uses
Quantitative determination of hydrogen by pulsed nuclear magnetic resonance spectroscopy, 9:2895 (R;US)
NUCLEAR MATERIALS DIVERSION
Government Policies
Decree No. 82-1050 of 13 December 1982 creating a Central Service for repression of illicit trading in weapons, munitions, explosive products and nuclear, biological and chemical materials, 9:2053 (R;FR;In French)
Motion Detection Systems
Development of an improved monitor for portal detection of the unauthorized removal of special nuclear material, 9:2057 (J;US)
NUCLEAR MATERIALS MANAGEMENT
Accounting
Attributes mode sampling schemes for international material accountancy verification, 9:2058 (J;US)
IAEA Safeguards
Measures for increasing IAEA safeguards effectiveness, 9:2059 (J;US)
Information Validation
Attributes mode sampling schemes for international material accountancy verification, 9:2058 (J;US)
Measures for increasing IAEA safeguards effectiveness, 9:2059 (J;US)
Inspection
Measures for increasing IAEA safeguards effectiveness, 9:2059 (J;US)
International Cooperation
Measures for increasing IAEA safeguards effectiveness, 9:2059 (J;US)
Material Balance
Attributes mode sampling schemes for international material accountancy verification, 9:2058 (J;US)
NUCLEAR MATTER
Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3770 (R;US)
Equations of State
Simplified equation of state near nuclear density, 9:3954 (J;NL)
Field Theories
Nonlinear mean field theory for nuclear matter and surface properties, 9:3953 (J;NL)
Many-Body Problem
Nonlinear mean field theory for nuclear matter and surface properties, 9:3953 (J;NL)
OPE Potential
Calculations of pion excess in nuclei, 9:3952 (J;US)
Phase Transformations
Phase transitions in nuclear matter and consequences for neutron stars, 9:3949 (R;DD)
Thermodynamics
States of matter in QCD, 9:3937 (RA;XC)
NUCLEAR PHYSICS
*Use only for indexing articles of very broad coverage, such as annual reviews, text books, etc.*
Research Programs
1981 Annual status report. Nuclear measurements, 9:3857 (R;XE)
Research in experimental nuclear physics. Progress report, 1 April 1983-31 March 1984 (University of Texas at Austin research at LAMPF), 9:3856 (R;US)
NUCLEAR POWER
Legal Aspects
Legal regime for the nuclear electricity-generating policy in France, 9:4269 (B;FR;In French)
NUCLEAR POWER PLANTS
Coordinated Research Programs
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)
Diesel Engines
Common cause failure rate estimates for diesel generators in nuclear power plants, 9:2499 (BA;US)
Economics
Nuclear customer services, 9:2469 (J;US)
Emergency Plans
Emergency plans for nuclear power accidents. Danish-Swedish exercise Oct 7th 1982, 9:2431 (R;SE;In Swedish)
Engineered Safety Systems
American National Standard: for safety-related cooling water systems in nuclear power plants, 9:2508 (B;US)
Availability analysis of standby safety systems, 9:2501 (BA;US)
Fault tree analysis using modular logic models, 9:2493 (BA;US)
Practical availability analysis of standby systems, 9:2315 (J;US)
In-Service Inspection
Inspection and maintenance plans. In-service inspections, 9:2339 (R;DE)
Licensing
Certification and qualification of suppliers and personnel for the Argentine nuclear program, 9:2307 (J;US)
Standardization and nuclear independence, 9:2483 (J;US)
Marketing
Nuclear customer services, 9:2469 (J;US)
Personnel
Overview of the need of manpower supply for a nuclear programme, 9:2311 (R;DE)
Overview of a procedure for human reliability analysis, 9:2313 (BA;US)
Utility considerations in emotional stability monitoring for nuclear plant personnel, 9:2194 (R;US)
Physical Protection
American National Standard: security for nuclear power plants, 9:2503 (B;US)
Professional Personnel
The program of cooperation between the King Abdulaziz University and the Swiss Federal Institute of Technology in the field of nuclear education and training, 9:2477 (J;US)
Quality Assurance
Certification and qualification of suppliers and personnel for the Argentine nuclear program, 9:2307 (J;US)
IRAM toward standardization in the nuclear field, 9:2484 (J;US)
Radiation Protection
Radiation protection technology transfer for overseas nuclear power stations, 9:2468 (J;US)
Reactor Accidents
Accident sequence evaluation for IREP, 9:2496 (BA;US)
Development of a data base for quantification of accident sequences, 9:2489 (BA;US)
Probabilistic methods for accident progression analysis, 9:2498 (BA;US)
Reactor Components
Structures for common-cause failure analysis, 9:2500 (BA;US)
Reactor Decommissioning
Community's research and development programme on decommissioning of nuclear power plants (year 1981). Annual progress report No. 2, 9:2442 (R;US)
Reactor Maintenance
Maintenance experience in Spain, 9:2473 (J;US)
Reactor Operation
Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2438 (R;US)
Reactor Simulators
Simulator training for nuclear power plant operation in Brazil, 9:2478 (J;US)
Reactor Sites
American National Standard: criteria and guidelines for assessing capability for surface faulting at nuclear power plant sites, 9:2504 (B;US)

**Regulations**
International exchange of knowledge with regard to safety, 9:2481 (J;US)
Radiation protection technology transfer for overseas nuclear power stations, 9:2468 (J;US)
**Risk Assessment**
IREP human reliability analysis, 9:2495 (BA;US)
On issues important to the development of a systems interaction evaluation procedure, 9:2497 (BA;US)
Organization for the performance of PRA programs, 9:2488 (BA;US)
Overview of a procedure for human reliability analysis, 9:2313 (BA;US)
Probabilistic methods for accident progression analysis, 9:2498 (BA;US)
**Safety Standards**
IRAM toward standardization in the nuclear field, 9:2484 (J;US)
National and international standards in nuclear technology transfer, 9:2482 (J;US)
Standardization and nuclear independence, 9:2483 (J;US)
**Specifications**
American National Standard: criteria for technical specifications for nuclear power stations, 9:2509 (B;US)
**Standards**
Certification and qualification of suppliers and personnel for the Argentine nuclear program, 9:2307 (J;US)
**Technology Transfer**
Education-prerequisite to adequate technology transfer, 9:2474 (J;US)
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)
The program of cooperation between the King Abdulaziz University and the Swiss Federal Institute of Technology in the field of nuclear education and training, 9:2477 (J;US)
Transfer of educational programs to the nuclear utility industry, 9:2479 (J;US)
**Training**
Transfer of educational programs to the nuclear utility industry, 9:2479 (J;US)

**NUCLEAR POWER STATIONS**
*See NUCLEAR POWER PLANTS*

**NUCLEAR PROPERTIES**
**Nuclear Data Collections**
Recent References January through April 1983, 9:3859 (J;US)

**NUCLEAR REACTIONS**
*See also FISSION*
*HADRON REACTIONS*
*LEPTON REACTIONS*
*PHOTONUCLEAR REACTIONS*
*PRECOMPOUND-NUCLEUS EMISSION*
*THERMONUCLEAR REACTIONS*
**Nuclear Data Collections**
Recent References January through April 1983, 9:3859 (J;US)
**Scattering Amplitudes**
Quantum chromodynamics in few-nucleon systems, 9:3773 (R;US)

**NUCLEAR SAFETY**
*See RADIATION PROTECTION*

**NUCLEAR SAFETY RESEARCH REACTOR (JAPAN)**
*See NSRR REACTOR*

**NUCLEAR SPIN RESONANCE**
*See NUCLEAR MAGNETIC RESONANCE*

**NUCLEAR STRUCTURE**
**Research Programs**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)

**NUCLEAR WASTES**
*See RADIOACTIVE WASTES*

**NUCLEAR WEAPON TESTS**
*See NUCLEAR EXPLOSIONS*

**NUCLEAR WEAPONS**
Preliminary nuclear terrorist effects study (Detonation in city street), 9:3250 (RA;US)
**Biological Effects**
Nuclear War, 9:3401 (J;US)
**Delayed Radiation Effects**
Nuclear War, 9:3401 (J;US)
**Environmental Impacts**
Nuclear War, 9:3401 (J;US)
**Meetings**
Proceedings: 17th Asilomar conference on fire and blast effects of nuclear weapons, 9:3226 (R;US)
**Public Opinion**
You have no right to make me think about this--the de-legitimation of current nuclear policies among key American elites, 9:2544 (R;US)

**NUCLEATION**
**Measuring Instruments**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)
**Measuring Methods**
Instrument to detect vapor nucleation of superheated drops, 9:3197 (J;US)

**NUCLEI**
*See also DEFORMED NUCLEI*
*HEAVY NUCLEI*
*HYPERNUCLEI*
*INTERMEDIATE MASS NUCLEI*
*LIGHT NUCLEI*
**Collective Excitations**
Damping of nuclear excitations, 9:3956 (J;US)
**High Spin States**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**Single-Particle Modes**
Damping of nuclear excitations, 9:3956 (J;US)
**Vibrational States**
Damping of nuclear excitations, 9:3956 (J;US)

**NUCLEOGENESIS**
*See NUCLEOSYNTHESIS*

**NUCLEON-ANTINUCLEON INTERACTIONS**
*See also PROTON-ANTIPROTON INTERACTIONS*
**Experiment Planning**
Antinucleon-nucleon physics, 9:3653 (RA;US)
Tagged antineutron experiments, 9:3655 (RA;US)

**NUCLEON-HYPERON INTERACTIONS**
Hyperon-nucleon interactions, 9:3659 (RA;US)
**Elastic Scattering**
Antihyperon-nucleon scattering, 9:3663 (RA;US)
Are there bound A = 2 hyperon states, 9:3662 (RA;US)
Polarizion experiments with hyperons, 9:3694 (RA;US)
**Experiment Planning**
ΞN scattering as a probe of the strong interaction, 9:3661 (RA;US)
**Inelastic Scattering**
Antihyperon-nucleon scattering, 9:3663 (RA;US)
**Scattering**
ΞN scattering as a probe of the strong interaction, 9:3661 (RA;US)

**NUCLEON-NUCLEON INTERACTIONS**
*See also PROTON-NUCLEON INTERACTIONS*
Quark search at the CBA, 9:3610 (R;US)
**Bag Model**
Primitives (eigenstates) of six-quark bags with an external pion field, 9:3767 (R;SU;In Russian)
**Bremsstrahlung**
Extension of the soft-photon theorem for bremsstrahlung, 9:3779 (J;US)
**Elastic Scattering**
Comparative study of the NNπ system, II. Elastic NN scattering, 9:3774 (R;IL)
Nucleon-nucleon scattering above LAMPF energies, 9:3665 (RA;US)
**Experiment Planning**
Nucleon-nucleon interactions: quark dynamics, 9:3664 (RA;US)
**Inelastic Scattering**
Nucleon-nucleon scattering above LAMPF energies, 9:3665 (RA;US)
**Invariance Principles**
Symmetries and the N-N interaction, 9:3814 (R;CA)
**Multiple Production**
Experiments with nuclear beams and targets, 9:3618 (RA;XC)

**P Invariance**
P-odd nuclear forces are a source of parity violation in atom, 9:3812 (RA;SU;In Russian)
**Weak Interactions**
Weak nucleon-nucleon interaction in few body systems, 9:3861 (R;FR)
**NUCLEON-NUCLEON POTENTIAL**
**Field Theories**
Short-range correlations in an extended time-dependent mean-field theory, 9:3947 (R;SU)
**NUCLEONS**
*See also NEUTRONS*
*PROTONS*
**Magnetic Moments**
Magnetic moments of baryons, 9:3777 (R;IL)
**Neutrino-Nucleon Interactions**
Nucleon structure functions, 9:3612 (RA;XC)
**Quark Model**
Relativistic wave functions of a nucleon as a quark-diquark bound state, 9:3765 (R;SU;In Russian)
**Wave Functions**
Relativistic wave functions of a nucleon as a quark-diquark bound state, 9:3765 (R;SU;In Russian)
**NUCLEOSYNTHESIS**
*See also THERMONUCLEAR REACTIONS*
**Unified Gauge Models**
Cosmological effects of primeval fermion degeneracy in the grand unified theories, 9:3486 (J;US)
**NUTRIENTS**
**Environmental Transport**
Nutrient spiralling in streams: implications for nutrient limitation and invertebrate activity, 9:3324 (J;US)
**Spatial Distribution**
Nutrient spiralling in streams: implications for nutrient limitation and invertebrate activity, 9:3324 (J;US)

## O

**OAK RIDGE RESEARCH REACTOR**
*See ORR REACTOR*
**OCCLUSION COMPLEXES**
*See CLATHRATES*
**OFF-GAS SYSTEMS**
**Air Filters**
Analysis of the five years in-situ control of the cleaning filters used in the nuclear installations in France, 9:2344 (RA;XA;In French)
**Meetings**
Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruhe, Germany, F.R., 3-7 May 1982, 9:1956 (R;XA)
**Performance**
Design, operation and in-plant testing of off-gas cleaning systems at BWRs, 9:2202 (RA;XA)
**OFFICE BUILDINGS**
**Energy Consumption**
Design methodology analysis: design and operational energy studies in a new high-rise office building. Volume 2, 9:2605 (R;US)
**OFFSHORE OPERATIONS**
**Data Acquisition Systems**
GIN: integrated navigation and data acquisition system, 9:1816 (BA;GB)
**Electronic Guidance**
Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system), 9:1824 (BA;GB)
GIN: integrated navigation and data acquisition system, 9:1816 (BA;GB)
**Positioning**
Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system), 9:1824 (BA;GB)
**Safety**
Safety of installations for work at sea, 9:1849 (BA;GB)
**OFFSHORE PLATFORMS**
*Includes gravity or fixed, floating, and towed platforms.*
**Construction**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report (203 references), 9:1822 (R;US)
**Cost**
Application of a concrete articulated buoyant column to offshore drilling and production systems, 9:1833 (BA;GB)
**Design**
Application of a concrete articulated buoyant column to offshore drilling and production systems, 9:1833 (BA;GB)
BP development of tethered buoyant platform production system, 9:1830 (BA;GB)
Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas, 9:1834 (BA;GB)
Design of two storage and loading floating platforms, 9:1831 (BA;GB)
Permanently located offshore structures the development of steel offshore jackets, 9:1832 (BA;GB)
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report (203 references), 9:1822 (R;US)
Subproject 2: an autonomous, manned, submersible catamaran equipment carrier - the Bruker Subcat, 9:1845 (BA;GB)
**Dimensions**
Design of two storage and loading floating platforms, 9:1831 (BA;GB)
**Foundations**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report (203 references), 9:1822 (R;US)
**Hazards**
Improvements to gas detection systems, 9:1838 (BA;GB)
**Installation**
Application of a concrete articulated buoyant column to offshore drilling and production systems, 9:1833 (BA;GB)
**Leaks**
Improvements to gas detection systems, 9:1838 (BA;GB)
**Materials**
Application of a concrete articulated buoyant column to offshore drilling and production systems, 9:1833 (BA;GB)
Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas, 9:1834 (BA;GB)
Design of two storage and loading floating platforms, 9:1831 (BA;GB)
**Performance**
Ben Ocean Lancer: a successful development programme for deepwater drilling, 9:1828 (BA;GB)
**Positioning**
Ben Ocean Lancer: a successful development programme for deepwater drilling, 9:1828 (BA;GB)
Deep sea drilling: extension of the dynamic positioning capacity by means of the long base, 9:1825 (BA;GB)
Operation of the special equipment installed on the dynamic stationing vessel Petrel, 9:1827 (BA;GB)
**Production**
BP development of tethered buoyant platform production system, 9:1830 (BA;GB)
**Safety**
Feasibility of leak detection in process plant on offshore installations, 9:1846 (R;NO)
Improvements to gas detection systems, 9:1838 (BA;GB)
Safety of installations for work at sea, 9:1849 (BA;GB)
**OGRA**
**Plasma Simulation**
Program complex for computation of the two-dimensional plasma distribution function in the OGRA-4 magnetic trap, 9:4052 (R;SU;In Russian)
**OHIO**
**Coal Deposits**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower

Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1783 (R;US)

**OIL BURNERS**
**Design**
Experimental investigation of fuel vaporization on combustion efficiency, 9:2620 (R;US)
**Performance**
Experimental investigation of fuel vaporization on combustion efficiency, 9:2620 (R;US)

**OIL FIELDS**
**Engineering**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Engineering Geology**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Evaluation**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)
**Geological Surveys**
Processing of geological and engineering data in multipay fields for evaluation, 9:1868 (RA;US)

**OIL FURNACES**
**Energy Efficiency**
Energy economical improvement of an oil heating system, 9:2625 (R;FI;In Finnish)

**OIL RESIDUES**
*See PETROLEUM RESIDUES*

**OIL SAND PROCESSING PLANTS**
**Monitoring**
Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1799 (R;US)
**Process Heat Reactors**
Application of the HTGR in tar sands oil recovery, 9:1902 (RA;CA)

**OIL SHALE MINING**
**Earthmoving Equipment**
Evaluation of mechanical excavation systems for oil-shale mining. Final technical report, 9:1901 (R;US)
**Mining Equipment**
Evaluation of mechanical excavation systems for oil-shale mining. Final technical report, 9:1901 (R;US)

**OIL SHALE PROCESSING PLANTS**
**Monitoring**
Environmental monitoring reference manual for synthetic fuels facilities. Users manual Sep 82-May 83, 9:1799 (R;US)

**OIL SHALE WASTE WATER**
*See OIL SHALES*
*WASTE WATER*

**OIL SHALES**
*See also BLACK SHALES*
**Chemical Analysis**
Reproducibility of chemical analyses of raw Colorado oil shales, 9:1903 (R;US)
**Fluidized-Bed Combustion**
Fluidized combustion of oil shale. Final report, 9:1904 (R;US)

**OIL WELLS**
**Blowout Preventers**
Remote-control of a blowout preventer and instrumented pup-joint of a riser, 9:1826 (BA;GB)
**Blowouts**
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**Carbon Dioxide Injection**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**In-Situ Combustion**
Enhanced recovery in heavy crude and bitumen deposits, 9:1842 (BA;GB)
**Microemulsion Flooding**
Treatment fluids to improve sea water injection, 9:1841 (BA;GB)
**Offshore Drilling**
Deep sea drilling: extension of the dynamic positioning capacity by means of the long base, 9:1825 (BA;GB)
Remote-control of a blowout preventer and instrumented pup-joint of a riser, 9:1826 (BA;GB)
**Offshore Platforms**
State-of-the-art review in foundation design and analysis for tension leg platforms and vertically moored platforms. Final report, 9:1822 (R;US)
**Offshore Sites**
Automated underwater wellhead, 9:1839 (BA;GB)
Deep sea productions: construction and operation of a pump down tools testing station in a production well, 9:1835 (BA;GB)
North-East Grondin experimental station, 9:1836 (BA;GB)
**Steam Injection**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
Enhanced recovery in heavy crude and bitumen deposits, 9:1842 (BA;GB)
**Underwater Facilities**
North-East Grondin experimental station, 9:1836 (BA;GB)
**Waterflooding**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**Well Servicing**
Deep sea productions: construction and operation of a pump down tools testing station in a production well, 9:1835 (BA;GB)
**Wellheads**
Automated underwater wellhead, 9:1839 (BA;GB)

**OILS**
*See also FUEL OILS*
*LUBRICATING OILS*
*MINERAL OILS*
*WASTE OILS*
**Aerosol Monitoring**
Eye-safe tracking of oil fog plumes by UV lidar, 9:3271 (J;US)
**Plumes**
Eye-safe tracking of oil fog plumes by UV lidar, 9:3271 (J;US)

**OLEFINS**
*See ALKENES*

**OMEGA MINUS**
**Electric Moments**
Omega-minus atoms, 9:3697 (RA;US)
**Quadrupole Moments**
Omega-minus atoms, 9:3697 (RA;US)

**ONCOGENIC TRANSFORMATIONS**
**Inhibition**
Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism, 9:3422 (J;US)

**ONE-NUCLEON TRANSFER REACTIONS**
**Spectroscopic Factors**
Two-quasiparticle strength distributions in $^{68}$Ni and $^{206}$Pb, 9:3894 (R;SU)

**ON-LINE COMPUTERS**
*See COMPUTERS*

**ON-LINE CONTROL SYSTEMS**
**Performance**
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)

**ONTARIO PHWR PICKERING-1 REACTOR**
*See PICKERING-1 REACTOR*

**OPERATION (REACTOR)**
*See REACTOR OPERATION*

**OPERATIONS RESEARCH**
**Uses**
What good is Operations Research after an emergency, 9:4239 (RA;US)

**OPERATORS(QUANTUM FIELD THEORY)**
*See QUANTUM OPERATORS*

**OPERATORS(QUANTUM MECHANICAL)**
*See QUANTUM OPERATORS*

**OPTICAL MODELS**
**Strength Functions**
Damping of nuclear excitations, 9:3956 (J;US)

**OPTICAL PUMPING**
**Phase Shift**
Observation of solitons in stimulated Raman scattering, 9:3558 (J;US)

**OPTICAL RADAR**
**Safety**
Eye-safe tracking of oil fog plumes by UV lidar, 9:3271 (J;US)
**OPTICAL SYSTEMS**
Realization of first order optical systems using thin lenses, 9:3999 (R;US)
**Tubes**
Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures, 9:3214 (J;US)
**OPTICALLY THICK PLASMA**
**Population Inversion**
Population inversion in an optically thick recombining hydrogen plasma, 9:4057 (R;JP)
**Recombination**
Population inversion in an optically thick recombining hydrogen plasma, 9:4057 (R;JP)
**OPTICALLY THIN PLASMA**
**Population Inversion**
Population inversion in an optically thick recombining hydrogen plasma, 9:4057 (R;JP)
**Recombination**
Population inversion in an optically thick recombining hydrogen plasma, 9:4057 (R;JP)
**OPTICS**
Generalized rays in first order optics: transformation properties of Gaussian Schell-model fields, 9:3998 (R;US)
Realization of first order optical systems using thin lenses, 9:3999 (R;US)
**Fourier Transformation**
Fourier optics for the Maxwell field: formalism and applications, 9:3997 (R;US)
**ORBITAL SOLAR POWER PLANTS**
**Design**
Spectrophotovoltaic orbital power generation. Final Report, August 1981-November 1982, 9:2133 (R;US)
**Efficiency**
Spectrophotovoltaic orbital power generation. Final Report, August 1981-November 1982, 9:2133 (R;US)
**ORGANIC ACIDS**
*Excluding NUCLEIC ACIDS and NUCLEOTIDES.*
*See also HUMIC ACIDS*
*SULFONIC ACIDS*
**Adsorption**
Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2902 (J;US)
**ORGANIC BROMINE COMPOUNDS**
**Labelling**
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
**ORGANIC CHLORINE COMPOUNDS**
*See also CHLORINATED ALIPHATIC HYDROCARBONS*
*CHLORINATED AROMATIC HYDROCARBONS*
**Photochemistry**
Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system, 9:3017 (J;US)
**Structural Chemical Analysis**
Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system, 9:3017 (J;US)
**ORGANIC COMPOUNDS**
*See also AMINES*
*AROMATICS*
*CARBONIC ACID DERIVATIVES*
*HYDROCARBONS*
*KETONES*
*LIPIDS*
*ORGANIC ACIDS*
*ORGANIC NITROGEN COMPOUNDS*
*ORGANIC OXYGEN COMPOUNDS*
*ORGANIC POLYMERS*
*ORGANIC SULFUR COMPOUNDS*
*ORGANOMETALLIC COMPOUNDS*
*STEROIDS*
**Electronic Structure**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**Fermi Level**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**Shubnikov-De Haas Effect**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**Superconductivity**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**ORGANIC IODINE COMPOUNDS**
**Photolysis**
Photochemical abatement of radioactive iodines, 9:1964 (RA;CA)
**ORGANIC NITROGEN COMPOUNDS**
*Excluding PROTEINS, AMINES, ALKALOIDS, AMINO ACIDS, NUCLEIC ACIDS, and NUCLEOTIDES.*
*See also AZAARENES*
*DIAZO COMPOUNDS*
*NITRO COMPOUNDS*
*PORPHYRINS*
**Chemical Reaction Kinetics**
Centrifugal distortion and internal rotation analysis of the microwave spectrum of ethyl fluoride, 9:3573 (J;US)
**Decomposition**
Centrifugal distortion and internal rotation analysis of the microwave spectrum of ethyl fluoride, 9:3573 (J;US)
**Photochemistry**
Cyclic D/sub 6h/ hexaazabenzene--a relative minimum on the $N_6$ potential energy hypersurface, 9:2985 (J;US)
**ORGANIC OXYGEN COMPOUNDS**
*Excluding HYDROXY COMPOUNDS, CARBONIC ACID DERIVATIVES, LIPIDS, STEROIDS, CARBOHYDRATES, ORGANIC ACIDS, ALDEHYDES, KETONES and ESTERS.*
*See also ETHERS*
*HETEROCYCLIC OXYGEN COMPOUNDS*
**Chemisorption**
Molecular orbital study of $O_2p$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Electron Spin Resonance**
Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Electronic Structure**
Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Fluorescence Spectroscopy**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)
**Photochemical Reactions**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)
**ORGANIC POLYMERS**
*See also GRAFT POLYMERS*
*POLYAMIDES*
*RESINS*
*RUBBERS*
**Absorption Spectra**
Efficient nonphotochemical hole burning of dye molecules in polymers, 9:2977 (J;US)
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**Chemical Preparation**
New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2960 (TG;US)
**Conformational Changes**
Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks, 9:2808 (J;US)
**Elasticity**
Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks, 9:2808 (J;US)
**Regeneration**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)

New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2960 (TG;US)

**ORGANIC SOLVENTS**

**Comparative Evaluations**

Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)

Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)

**Hydrogen Transfer**

Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)

**Recycling**

Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)

**Solvent Properties**

Solvent tailoring in coal liquefaction based on critical properties of physical solvating agents and hydrogen donors, August 1, 1980-July 31, 1981, 9:1756 (R;US)

**ORGANIC SULFUR COMPOUNDS**

*See also METHIONINE*
*SULFONATES*
*SULFONIC ACIDS*

**Biological Accumulation**

Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**Biological Effects**

Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**Carcinogen Screening**

Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**Chemical Reaction Yield**

Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**Chemical Reactions**

Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**Desulfurization**

Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)

**Energy Analysis**

Energetics and structures of organosulfur ions: $CH_3SSCH_3^+$, $CH_3SS^+$, $C_2H_5S^+$, and $CH_3SH^+$, 9:2981 (J;US)

**Fluorescence**

Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene, 9:2986 (J;US)

**Mutagen Screening**

Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**Photoionization**

Energetics and structures of organosulfur ions: $CH_3SSCH_3^+$, $CH_3SS^+$, $C_2H_5S^+$, and $CH_3SH^+$, 9:2981 (J;US)

**Radiationless Decay**

Fluctuations of cross sections in chemical processes: Infrared photoquenching of fluorescent states in thiophosgene, 9:2986 (J;US)

**Reviews**

Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**Structural Chemical Analysis**

Energetics and structures of organosulfur ions: $CH_3SSCH_3^+$, $CH_3SS^+$, $C_2H_5S^+$, and $CH_3SH^+$, 9:2981 (J;US)

**ORGANOMETALLIC COMPOUNDS**

*For compounds of metals and semimetals with organic compounds, but only when the metal or semimetal is directly bound to carbon.*

Some recent advances in uranocene chemistry (Benzocyclooctatetraene), 9:2909 (R;US)

**ORNL RESEARCH REACTOR**

*See ORR REACTOR*

**ORR REACTOR**

**Burnup**

Licensing procedures and safety criteria for core conversion in Japan, 9:2349 (RA;US)

**ORYZA**

*See RICE*

**OSCILLATIONS (PLASMA)**

*See PLASMA WAVES*

**OSCILLATORS**

*See also ANHARMONIC OSCILLATORS*

**Specifications**

Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4051 (R;FR;In French)

**OSIRIS REACTOR**

**Fuel Plates**

Caramel fuel in OSIRIS: the complete conversion of a high flux research to a low enriched fuel, 9:2363 (RA;US)

**OSMIUM COMPLEXES**

**Excitation**

Lifetimes of the ligand-to-metal charge-transfer excited states of iron(III) and osmium(III) polypyridine complexes. Effects of isotopic substitution and temperature, 9:2919 (J;US)

**PH Value**

Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2955 (J;US)

**OSMIUM COMPOUNDS**

**Chemical Preparation**

Supported transition metal compounds. I. A new method for the preparation of alumina-supported iridium and osmium carbonyls, 9:2918 (J;US)

**OUTER CONTINENTAL SHELF**

*See CONTINENTAL SHELF*

**OXALALDEHYDE**

*See GLYOXAL*

**OXETANE**

*See ETHERS*
*HETEROCYCLIC OXYGEN COMPOUNDS*

**OXIDANTS**

*See OXIDIZERS*

**OXIDATION STATE**

*See VALENCE*

**OXIDES**

*See also ALUMINIUM OXIDES*
*BARIUM OXIDES*
*BERKELIUM OXIDES*
*CALCIUM OXIDES*
*CHROMIUM OXIDES*
*COBALT OXIDES*
*COPPER OXIDES*
*CURIUM OXIDES*
*GADOLINIUM OXIDES*
*INDIUM OXIDES*
*IRON OXIDES*
*LITHIUM OXIDES*
*MAGNESIUM OXIDES*
*MOLYBDENUM OXIDES*
*NICKEL OXIDES*
*NITROGEN OXIDES*
*PLATINUM OXIDES*
*RUTHENIUM OXIDES*
*SCANDIUM OXIDES*
*SILICON OXIDES*
*TANTALUM OXIDES*
*THORIUM OXIDES*
*TITANIUM OXIDES*
*TUNGSTEN OXIDES*
*VANADIUM OXIDES*
*YTTRIUM OXIDES*
*ZINC OXIDES*
*ZIRCONIUM OXIDES*

**Mesic Atoms**

Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3531 (R;SU;In Russian)

**Reflection**

Reflection and refraction imaging of oxide surfaces in TEM and STEM, 9:2798 (J;US)

**Refraction**
Reflection and refraction imaging of oxide surfaces in TEM and STEM, 9:2798 (J;US)

**OXIDIZERS**
**Chemical Preparation**
New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2960 (TG;US)

**OXIDIZING AGENTS**
*See OXIDIZERS*

**OXYGEN**
**Chemisorption**
Catalytic coal liquefaction. Quarterly report, July-September 1983, 9:1757 (R;US)
**Electron Attachment**
Electron attachment to oxygen in supercritical hydrocarbon fluids, 9:2976 (J;US)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Fine Structure**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Neutron Reactions**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**P States**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**Production**
Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983, 9:2523 (R;US)
**Reduction**
Bifunctional oxygen electrodes. Final report, 9 October 1980-1 April 1983, 9:2523 (R;US)

**OXYGEN 16**
**Hypernuclei**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)

**OXYGEN 16 REACTIONS**
**Deep Inelastic Heavy Ion Reactions**
Quark matter formation in high energy nucleus-nucleus collisions - predictions and observations, 9:3929 (RA;XC)
**Fragmentation**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Rutherford Scattering**
Optical theorem and forward glory effects in heavy-ion scattering, 9:3942 (R;BR)

**OXYGEN 16 TARGET**
**Antiproton Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Kaon Minus Reactions**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Kaon Plus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Neon 20 Reactions**
Fusion and peripheral processes in the collisions of $^{20}$Ne+ $^{20}$Ne and $^{20}$Ne+ $^{16}$O, 9:3881 (J;US)
**Pion Minus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Pion Plus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)

**OXYGEN 18 REACTIONS**
**Fragmentation**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)

**OXYGEN 18 TARGET**
**Antiproton Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Kaon Minus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Kaon Plus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Pion Minus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Pion Plus Reactions**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)

**OXYGEN EFFECT (RADIOBIOLOGY)**
*See OXYGEN*

**OXYGEN HYDRIDES**
*See WATER*

**OXYGEN IONS**
**Ion-Atom Collisions**
Theoretical studies of highly-ionized species. Progress report, March 1, 1983-February 28, 1984, 9:3509 (R;US)

**OXYMETHYLENE**
*See FORMALDEHYDE*

**OZONE**
**Health Hazards**
Respiratory effects of air pollutants, 9:3410 (R;SE;In Swedish)

## P

**P REACTOR**
**Thermal Pollution**
Thermal-effects study, 9:2342 (R;US)

**PACIFIC NORTHWEST REGION**
*See FEDERAL REGION X*

**PACIFIC OCEAN**
**Atmospheric Precipitations**
Teleconnections with tropical precipitation surges, 9:3254 (J;US)
**Ice**
Development of a simple upper-ocean and sea-ice model, 9:3438 (J;US)
**Temperature Distribution**
Development of a simple upper-ocean and sea-ice model, 9:3438 (J;US)

**PACKAGING**
**Design**
Initial specifications for nuclear waste package external dimensions and materials, 9:1999 (R;US)
**Dimensions**
Initial specifications for nuclear waste package external dimensions and materials, 9:1999 (R;US)
**Specifications**
Initial specifications for nuclear waste package external dimensions and materials, 9:1999 (R;US)

**PAH**
*See POLYCYCLIC AROMATIC HYDROCARBONS*

**PALLADIUM**
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Adsorption**
Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)
**Catalytic Effects**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)

Supported palladium catalysts for the reduction of sodium bicarbonate to sodium formate in aqueous solution at room temperature and one atmosphere of hydrogen, 9:2917 (J;US)

**Deactivation**

Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)

**Electronic Structure**

Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)

**Matrix Isolation**

Evolution of a metal: A photoemission study of the growth of Pd clusters, 9:2733 (J;US)

**Photoemission**

Evolution of a metal: A photoemission study of the growth of Pd clusters, 9:2733 (J;US)

**Spectrophotometry**

Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)

**Surface Properties**

Investigation of adsorption, dissociation and desorption of nitrogen monoxide upon a single-crystalline palladium-surface, 9:2910 (R;DE;In German)

**PALLADIUM ALLOYS**

*See also PALLADIUM BASE ALLOYS*

**Electric Conductivity**

Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$, 9:2737 (J;US)

**Electronic Structure**

Calculation of self-consistent potentials for substitutionally disordered systems with application to the Ag/sub x/-Pd/sub 1-x/ alloy series, 9:2731 (J;US)

Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$, 9:2736 (J;US)

**Magnetization**

Electrical resistivity and magnetization of the intermediate valence compound $CePd_3$, 9:2737 (J;US)

Temperature dependence of the field induced magnetic form factor of the intermediate valence compound $CePd_3$, 9:2736 (J;US)

**PALLADIUM BASE ALLOYS**

**Electron Spectroscopy**

Electron tunneling spectroscopy of intermediate valence materials, 9:2747 (BA;NL)

**PARABANIC ACID**

*See ORGANIC OXYGEN COMPOUNDS*

**PARABOLIC TROUGH COLLECTORS**

**Commercialization**

Line-focusing adjustable parabolic solar-concentrating collector. Final report, 9:2142 (R;US)

**Freeze Protection**

Determination of freeze-protection heat loss from a parabolic trough solar system, 9:2144 (R;US)

**Heat Losses**

Determination of freeze-protection heat loss from a parabolic trough solar system, 9:2144 (R;US)

**PARACHUTES**

**Design**

High-speed, low-altitude payload delivery using a single large ribbon parachute, 9:3066 (R;US)

**Performance**

High-speed, low-altitude payload delivery using a single large ribbon parachute, 9:3066 (R;US)

**PARAFFINS**

*See ALKANES*

**PARAMAGNETIC RESONANCE (ELECTRON)**

*See ELECTRON SPIN RESONANCE*

**PARAMAGNETIC RESONANCE (NUCLEAR)**

*See NUCLEAR MAGNETIC RESONANCE*

**PARAMETRIC INSTABILITIES**

Study of parametric instabilities during the Alcator C lower hybrid wave heating experiments, 9:4045 (R;US)

**Ion Acoustic Waves**

Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks, 9:4104 (J;US)

**Plasma Waves**

Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks, 9:4104 (J;US)

**PARTICLE BEAMS**

*See also HYPERON BEAMS*

**Beam Emittance**

Experience with a double-compensating beam calorimeter, 9:3140 (J;US)

**PARTICLE SIZE**

**Control**

Modification of coal-fly-ash size distribution. Final technical progress report No. 4, 1 August 1980-31 December 1982, 9:1791 (R;US)

**PARTICLE TRACKS**

**Multiwire Proportional Chambers**

Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3182 (R;SU;In Russian)

**Spatial Resolution**

Study of the accuracy of particle track detection by proportional chambers using cathode information readout, 9:3182 (R;SU;In Russian)

**PARTICLE-INDUCED X-RAY EMISSION ANALYSIS**

*See X-RAY EMISSION ANALYSIS*

**PARTICULATES**

*Prior to September 1981, this concept was indexed to PARTICLES and AEROSOLS.*

**Sample Preparation**

Preparation of ceramic particulates for transmission electron microscopy, 9:2671 (BA;US)

**PATHOGENS**

**Biological Accumulation**

Accumulation of sediment-associated viruses in shellfish, 9:3419 (J;US)

**PATIENTS**

**Contamination**

Review of three incidents involving the release of $^{125}I$ from seeds interstitially implanted within the prostate gland, 9:3390 (J;GB)

**PAVEMENTS**

**Maintenance**

Microwave methods and apparatus for paving and paving maintenance. Final report on Phase I, 9:2637 (R;US)

**Testing**

Fuel and tyre costs and driving comfort on the surface dressing, 9:2636 (R;FI;In Finnish)

**PBF REACTOR**

**Reactor Safety**

Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)

**PCB**

*See CHLORINATED AROMATIC HYDROCARBONS*

**PCM ACCIDENTS**

*See POWER-COOLING-MISMATCH ACCIDENTS*

**PDX DEVICES**

**Neutral Atom Beam Injection**

Theory of mode-induced beam particle loss in tokamaks, 9:4111 (J;US)

**Reactor Fueling**

Performance characterization of pneumatic single pellet injection system, 9:4146 (R;US)

**PEAT**

**Chemical Analysis**

Propertier of indigenous fuels. Part 3. Readily volatile compounds of peat, 9:1789 (R;FI;In Finnish)

**Combustion**

Solid fuels technology in the 80s, 9:2091 (R;SE;In Swedish)

**Combustion Properties**

Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples (Finland), 9:2093 (R;FI;In Finnish)

**Comparative Evaluations**

Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)

Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2107 (R;FI;In Finnish)

Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2556 (R;FI;In Finnish)
**Cost**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2107 (R;FI;In Finnish)
Competitiveness of indigenous solid fuels 1982 in Finland, Part 3. Condensing power and auxiliary condensing power, 9:2556 (R;FI;In Finnish)
**Drying**
Properties of indigenous fuels. Part 1. Effect of thermal drying on the structure of sod peat, 9:1808 (R;FI;In Finnish)
**Hydrogenation**
High pressure hydrogenation of solid fuels, 9:1775 (R;FI;In Finnish)
**Shrinkage**
Properties of indigenous fuels. Part 1. Effect of thermal drying on the structure of sod peat, 9:1808 (R;FI;In Finnish)
**Uses**
Peat-fired electric power plants (Sweden), 9:1810 (R;SE;In Swedish)
**Volatile Matter**
Propertier of indigenous fuels. Part 3. Readily volatile compounds of peat, 9:1789 (R;FI;In Finnish)

**PEATGAS PROCESS**
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)

**PEBBLE BED REACTORS**
*See also THTR-300 REACTOR*
**Coated Fuel Particles**
Experimental investigations of actinide release from coated fuel particles for high-temperature reactors, 9:2435 (R;DE;In German)

**PELLET INJECTION**
**Pneumatic Transport**
Development of hydrogen pellet injectors and pellet fuelling experiments at Oak Ridge National Laboratory, 9:4224 (BA;XA)

**PELLETS (FUEL)**
*See FUEL PELLETS*

**PENNSYLVANIA**
**Coal Deposits**
Data base for the analysis of compositional characteristics of coal seams and macerals. Final report: Part 4. Characterization of the organic structure of the Lower Kittanning coal seam using Fourier-transform infrared spectroscopy and optical properties, 9:1783 (R;US)

**PENTAERYTHRITOL TETRANITRATE**
*See PETN*

**PEOPLE**
*See HUMAN POPULATIONS*

**PERIOSTEUM**
*See BONE TISSUES*

**PERIPHYTON**
*See AUFWUCHS*

**PERMEABILITY**
**Measuring Instruments**
Investigation of fracture permeability around an underground opening in metamorphic rocks, 9:3435 (R;US)

**PEROXIDES**
*See also HYDROGEN PEROXIDE*
**Photochemical Reactions**
Reactions of bis(dimethylglyoximato)cobalt(II) complexes with tert-butyl hydroperoxide, 9:2979 (J;US)

**PERSONNEL**
*Studies of groups of persons employed in a particular field of endeavor. For studies on individuals in a group see also MAN.*
*See also PROFESSIONAL PERSONNEL*
*SECURITY PERSONNEL*
**Biological Radiation Effects**
Melanoma case-control study at the Los Alamos National Laboratory, 9:3389 (J;GB)
**Education**
Process of designing effective training courses and programs, 9:2268 (RA;CA)
**Health Hazards**
Effect of arsenic on the system, 9:3407 (R;SE;In Swedish)
**Human Factors**
Overview of a procedure for human reliability analysis, 9:2313 (BA;US)
**Mental Disorders**
Effects of the accident at Three Mile Island on the mental health and behavioral responses of the general population and nuclear workers, 9:2455 (J;GB)
**Radiation Doses**
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1821 (R;US)
High altitude radiation exposure in the SR-71: a preliminary report. Professional study, 9:3384 (R;US)
Projected occupational exposures during WIPP operations, 9:2002 (J;US)
**Radiation Monitoring**
Calibration of a decay-product collection and counting apparatus for the determination of exhaled thoron, 9:3198 (J;GB)
**Reliability**
Overview of a procedure for human reliability analysis, 9:2313 (BA;US)
Utility considerations in emotional stability monitoring for nuclear plant personnel, 9:2194 (R;US)
**Training**
Training of health physics services staff at the Sellafield Works of British Nuclear Fuels, 9:2047 (RA;CA)

**PERYLENE**
**Photochemical Reactions**
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)

**PETN**
**Liquid Column Chromatography**
PETN homolog analysis and large-scale preparation of pure PETN homologs by high-performance liquid chromatography (HPLC), 9:3224 (R;US)

**PETROCHEMICAL PLANTS**
**Sludges**
Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82, 9:1851 (R;US)

**PETROLEUM**
*Limited to crude oil; see also COAL LIQUIDS, SHALE OIL, etc.*
**Chemical Composition**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1814 (R;US)
**Chemical Properties**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
**Coking**
Evaluation of coking behavior in coal liquefaction process equipment, 9:1776 (J;US)
**Density**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
**Enhanced Recovery**
Enhanced oil recovery: a strategy for improving domestic production, 9:1820 (R;US)
Environmental assessment of the use of radionuclides as tracers in the enhanced recovery of oil and gas. Final report, 9:1821 (R;US)
**Exploration**
Opportunity to increase oil and gas exploration and lease rental income, 9:1855 (R;US)
**Land Leasing**
Opportunity to increase oil and gas exploration and lease rental income, 9:1855 (R;US)
**Maritime Transport**
Production and operation of a full-scale testing loop for studying disphasic flows, 9:1856 (BA;GB)

**Market**
Switzerland and mineral oil 1981-1982, 9:2559 (R;CH;In German)
**Origin**
Studies related to the deep earth gas. Annual report Jan-Dec 82, 9:1871 (R;US)
**Phase Diagrams**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**Reserves**
Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles, 9:1905 (RA;CA)
**Solvent Properties**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)
**Storage Facilities**
Installation of a submerged storage facility by means of a multi-articulation column, 9:1866 (BA;GB)
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Underwater storage tank system: a new conception for the storage of oil and methanol, 9:1864 (BA;GB)
Underwater oil storage tank for 300 MWd, 9:1865 (BA;GB)

**PETROLEUM COKE**
*See COKE*

**PETROLEUM DEPOSITS**
*See also OIL FIELDS*
**Evaluation**
Development of a recovery method for Adriatic Sea heavy oil reservoirs, 9:1818 (BA;GB)
**Exploitation**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**Exploration**
Development of a recovery method for Adriatic Sea heavy oil reservoirs, 9:1818 (BA;GB)
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**Forecasting**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)
**Geochemical Surveys**
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1814 (R;US)
**Geological Surveys**
Development of a recovery method for Adriatic Sea heavy oil reservoirs, 9:1818 (BA;GB)
**Geophysical Surveys**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
**Offshore Sites**
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**Petroleum Geology**
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1814 (R;US)
**Resource Assessment**
Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico, 9:1813 (R;US)
**Seismic Surveys**
Attempt to control the frequency spectrum transmitted during the implosion generated by a steam gun in offshore seismics (VAPORCHOC), 9:1815 (BA;GB)

**PETROLEUM INDUSTRY**
**Distillation**
Catalytic distillation: a government-industry success story, 9:2643 (R;US)
**Economic Impact**
Impacts of alcohol fuels on the US refining industry, 9:2641 (R;US)
**Exploration**
DEMINEX activities 1980, 9:2558 (R;DE;In German)
**Management**
Project safety reviews: an aid to management, 9:1848 (BA;GB)
**Occupational Safety**
Mines Safety and Health Commission for the mining and other extractive industries. Its role in oil and gas exploration and extraction, 9:1847 (BA;GB)
**Production**
DEMINEX activities 1980, 9:2558 (R;DE;In German)
**Rate Structure**
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
**Safety**
Project safety reviews: an aid to management, 9:1848 (BA;GB)

**PETROLEUM REFINERIES**
**Safety**
Project safety reviews: an aid to management, 9:1848 (BA;GB)
**Sludges**
Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82, 9:1851 (R;US)

**PETROLEUM RESIDUES**
*B.P. over 1100°F, 593°C; includes oil residues, residua.*
**Solvent Properties**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, July 15, 1982-October 15, 1982, 9:1763 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)

**PETTEN HIGH FLUX REACTOR**
*See HFR REACTOR*

**PFR REACTOR**
**Radioactive Wastes**
Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment, 9:1994 (R;US)

**PHANTOMS**
**Depth Dose Distributions**
Calculation of dose from external photon exposures using reference human phantoms and Monte-Carlo methods. Pt. 1, 9:3973 (R;DE)

**PHASE CHANGE MATERIALS**
*Use with the specific phase change material (e.g. calcium chloride) when known.*
**Production**
Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3030 (J;US)
**Reviews**
Research opportunities in salt hydrates for thermal energy storage (Bibliography and glossary included), 9:2515 (R;US)

**PHASE TRANSFORMATIONS**
*See also EVAPORATION*
*MELTING*
**Mathematical Models**
Breakdown of maximality conjecture in continuous phase transitions, 9:4016 (R;IL)

**PHENIX REACTOR**
**Neutron Absorbers**
Survey of C.E.A. absorber materials development program, 9:2274 (R;FR)

**PHENOBARBITAL**
**Biological Effects**
Development of a model to simulate the characteristics of rat liver tumor promotion by phenobarbital, 9:3421 (J;US)
**PHENOLS**
*See also CRESOLS*
*NAPHTHOLS*
*NITROPHENOL*
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Labelling**
Regiospecific incorporation of radioiodine into aromatic rings via organosilanes, 9:3042 (J;GB)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**PHENYLAMINE**
*See ANILINE*
**PHI4-FIELD THEORY**
**Feynman Diagram**
Application of Gegenbauer polynomial technique to 5-loop calculations in gphi$^4$ theory, 9:4008 (RA;SU;In Russian)
**Polynomials**
Application of Gegenbauer polynomial technique to 5-loop calculations in gphi$^4$ theory, 9:4008 (RA;SU;In Russian)
**PHOSPHATES**
*For salts only; see also PHOSPHORIC ACID ESTERS.*
*See also INDIUM PHOSPHATES*
*URANYL PHOSPHATES*
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**PHOSPHORIC ACID**
**Chemical Reactions**
Desulfurization of dibenzothiophene by nickel(0) complexes: evidence for electron transfer in oxidative additions, 9:2901 (J;US)
**PHOSPHORIC ACID ESTERS**
**Copolymerization**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**PHOSPHORUS**
**Biogeochemistry**
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3335 (J;US)
**Fine Structure**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**Mineral Cycling**
Phosphorus dynamics in a woodland stream ecosystem: a study of nutrient spiralling, 9:3335 (J;US)
**P States**
Theoretical studies of atomic transitions. Progress report, March 15, 1983-March 14, 1984, 9:3511 (R;US)
**PHOTOCHEMICAL REACTIONS**
**Research Programs**
Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983, 9:3000 (R;US)
**PHOTOCONDUCTORS**
**Performance**
Performance and materials aspects of Ge:Be and Ge:Ga photoconductors for far-infrared detection, 9:3205 (R;US)
**PHOTODIODES**
**Energy Resolution**
Linearity and resolution of photodiodes, 9:3194 (R;US)
**PHOTODISINTEGRATION**
*See PHOTONUCLEAR REACTIONS*
**PHOTOELECTROCHEMICAL CELLS**
**Electrodes**
Photoluminescent properties of n-GaAs electrodes: applications of the dead-layer model to photoelectrochemical cells. Technical report, 9:2099 (R;US)
**Energy Levels**
Chemically induced interface states in photoelectrochemical cells, 9:2125 (J;US)
**Photoanodes**
Chemically derivatized semiconductor photoelectrodes. Interim technical report, 9:2098 (R;US)
**Redox Reactions**
Applications of photoinduced electron transfer and hydrogen abstraction reactions to chemical and electrochemical conversion processes. Part I. Progress report, March 1, 1981-July 1, 1983, 9:3000 (R;US)
**PHOTOELECTRON SPECTROSCOPY**
**Synchrotron Radiation**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**PHOTOGRAPHS**
*See IMAGES*
**PHOTOMAGNETIC EFFECT**
*See VISIBLE RADIATION*
**PHOTOMAGNETOELECTRIC EFFECT**
*See MAGNETIC FIELDS*
**PHOTON ACTIVATION ANALYSIS**
*See PHOTONS*
**PHOTON DETECTION (GAMMA)**
*See GAMMA DETECTION*
**PHOTONS**
**Dose Equivalents**
Dose-rate conversion factors for external exposure to photons and electrons, 9:3392 (J;GB)
**Pair Production**
Pair production and annihilation in strong magnetic fields, 9:3459 (R;US)
Pair production near threshold in pulsar magnetic fields, 9:3462 (R;US)
**Particle Production**
Inclusive production of direct photons in 200-GeV/c collisions, 9:3719 (J;US)
**PHOTONUCLEAR REACTIONS**
**Breakup Reactions**
Deuteron forward photodisintegration: meson currents and relativity, 9:3866 (R;US)
**Inclusive Interactions**
Inclusive spectra of hadrons in photon-nucleus collisions, 9:3736 (R;SU)
**PHOTOSYNTHETIC BACTERIA**
**Biochemistry**
A fluorescent aminolipid from a green photosynthetic bacterium, 9:3346 (J;US)
**Functional Models**
Aggregation of the bacteriochlorophylls c, d, and e. Models for the antenna chlorophylls of green and brown photosynthetic bacteria, 9:2992 (J;US)
**PHOTOVOLTAIC CONVERSION**
**Semiconductor Junctions**
Coherent conversion of the sunlight spectrum. Final Report, 28 July 1980-30 April 1982, 9:2110 (R;US)
**PHOTOVOLTAIC POWER SUPPLIES**
**Design**
Photovoltaics in the Pacific Islands: an introduction to PV systems, 9:2130 (R;US)
**Performance Testing**
Development of a 1 pKW photovoltaic concentrator system with silicon cells, 9:2131 (R;XE)
**Silicon Solar Cells**
Development of a 1 pKW photovoltaic concentrator system with silicon cells, 9:2131 (R;XE)
**Solar Concentrators**
Development of a 1 pKW photovoltaic concentrator system with silicon cells, 9:2131 (R;XE)

**PHTHALOCYANINES**
**Chemical Bonds**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)
**Perturbed Angula- Correlation**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)
**PHWR TYPE REACTORS**
*See also ATUCHA REACTOR*
*BRUCE-1 REACTOR*
*DOUGLAS POINT ONTARIO REACTOR*
*GENTILLY-2 REACTOR*
*PICKERING-1 REACTOR*
**Reactor Safety**
Safety systems of heavy water reactors and small power reactors, 9:2205 (R;DE)
**PHYSICAL PROTECTION**
*Concerning the need for physical protection of facilities, devices, or materials from intentional damage or theft, and proposed or existing methods for meeting needs. See also PHYSICAL PROTECTION DEVICES.*
**Standards**
American National Standard: security for nuclear power plants, 9:2503 (B;US)
**PHYSICAL RADIATION EFFECTS**
**Research Programs**
State and problems of scientific research automation in radiation damage physics in KFTI, 9:2542 (RA;SU;In Russian)
**PHYSICS**
*See also HIGH ENERGY PHYSICS*
*NUCLEAR PHYSICS*
*REACTOR PHYSICS*
**Bibliographies**
Progress report 1982 of the Institute of Experimental Physics of the Leopold Franzens University Innsbruck, 9:3529 (R;AT;In German)
**Research Programs**
Progress report 1982 of the Institute of Experimental Physics of the Leopold Franzens University Innsbruck, 9:3529 (R;AT;In German)
Progress report 1981, 9:3851 (R;AT)
Progress report 1982, 9:3852 (R;AT)
Progress report 1982, 9:3853 (R;AT;In German)
Progress report 1981, 9:3854 (R;AT;In German)
Progress report 1981/82, 9:3855 (R;AT;In German)
**PHYTOPLANKTON**
**Ecological Succession**
Effects of differential growth and mortality in the seasonal succession of phytoplankton populations in Lawrence Lake, Michigan, 9:3323 (J;US)
**Population Dynamics**
Effects of differential growth and mortality in the seasonal succession of phytoplankton populations in Lawrence Lake, Michigan, 9:3323 (J;US)
**Radiation Monitoring**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)
**Species Diversity**
Effects of differential growth and mortality in the seasonal succession of phytoplankton populations in Lawrence Lake, Michigan, 9:3323 (J;US)
**PICKERING-1 REACTOR**
**Human Factors**
Analysis of human error trends at the Pickering A nuclear generating station, 9:2256 (RA;CA)
**Personnel**
Analysis of human error trends at the Pickering A nuclear generating station, 9:2256 (RA;CA)
**PICOLINES**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Solvent Properties**
Dissolution of coal in solvents, 9:1777 (D;US)
**PIGE ANALYSIS**
*See PROTON REACTIONS*
**PILES**
*See FOUNDATIONS*
**PI-MU ATOMS**
Exotic atoms and hyperon properties, 9:3695 (RA;US)
**Lifetime**
Determining the lifetime of the $\pi$/sup +-/$\mu$/sup -+/ atom, 9:3698 (RA;US)
**PINS (FUEL)**
*See FUEL PINS*
**PION MINUS REACTIONS**
**Capture**
Precompound analyses of spectra and yields following nuclear capture of stopped $\pi$p, 9:3878 (J;US)
**Charge-Exchange Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Elastic Scattering**
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{12}$C by an optical potential and a collective model, 9:3882 (J;US)
**Inelastic Scattering**
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{12}$C by an optical potential and a collective model, 9:3882 (J;US)
Excitation of the isoscalar giant quadrupole resonance in $^{118}$Sn($\pi^{+-}$,$\pi^{+-\prime}$), 9:3911 (J;US)
Pion spectroscopy at LAMPF II: possibilities for EPICS II, 9:3146 (RA;US)
**Multiple Scattering**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}$O and $^{18}$O at 800 MeV, 9:3871 (RA;US)
**Particle Production**
Differential cross section of eta meson production on carbon by $\pi^-$ mesons at the momentum of 3.3 GeV/c, 9:3632 (R;SU;In Russian)
Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$N and $\pi^-$C interactions at 40 GeV/c in different reference frames, 9:3630 (R;SU;In Russian)
**PION MINUS-NEUTRON INTERACTIONS**
**Particle Production**
Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$N and $\pi^-$C interactions at 40 GeV/c in different reference frames, 9:3630 (R;SU;In Russian)
**PION MINUS-PROTON INTERACTIONS**
**Jet Model**
Hard scattering and jet physics in connection with real photons, 9:3617 (RA;XC)
**Particle Production**
Study on the dimensions of the radiation region of secondary negative pions produced in $\pi^-$N and $\pi^-$C interactions at 40 GeV/c in different reference frames, 9:3630 (R;SU;In Russian)
**PION PLUS REACTIONS**
**Charge-Exchange Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)
**Elastic Scattering**
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{12}$C by an optical potential and a collective model, 9:3882 (J;US)
Nuclear medium effects in pion elastic scattering and charge exchange, 9:3880 (J;US)
**Inclusive Interactions**
Inclusive production of direct photons in 200-GeV/c collisions, 9:3719 (J;US)

**Inelastic Scattering**
Analysis of elastic and inelastic scattering of 162 MeV pions from $^{12}C$ by an optical potential and a collective model, 9:3882 (J;US)
Excitation of the isoscalar giant quadrupole resonance in $^{118}Sn(\pi^{+-},\pi^{+-}')$, 9:3911 (J;US)
Pion spectroscopy at LAMPF II: possibilities for EPICS II, 9:3146 (RA;US)
**Multiple Scattering**
Measurement of anti p, $K^{+-}$, and $\pi^{+-}$ scattering from $^{16}O$ and $^{18}O$ at 800 MeV, 9:3871 (RA;US)

**PION PLUS-PROTON INTERACTIONS**
**Jet Model**
Hard scattering and jet physics in connection with real photons, 9:3617 (RA;XC)
**Multiple Production**
Energy and quantum number fluxes in $K^+p$ and $\pi^+p$ interactions at 32 and 70 GeV/c, 9:3623 (R;SU;In Russian)

**PION REACTIONS**
*See also PION MINUS REACTIONS*
*PION PLUS REACTIONS*
**Absorption**
Study of pion-nucleus reactions with high-energy pion beams, 9:3863 (RA;US)
**Charge-Exchange Reactions**
Double-charge-exchange reactions, 9:3872 (RA;US)
**Elastic Scattering**
Nuclear structure and nuclear reactions, 9:3902 (RA;US)
**Experiment Planning**
Activation studies of the interactions of kaons, antiprotons, and high-energy pions with complex nuclei, 9:3874 (RA;US)
**Fragmentation**
Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles, 9:3922 (RA;US)
**Inelastic Scattering**
Nuclear structure and nuclear reactions, 9:3902 (RA;US)
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**Knock-Out Reactions**
Study of pion-nucleus reactions with high-energy pion beams, 9:3863 (RA;US)
**Quasi-Free Reactions**
Study of pion-nucleus reactions with high-energy pion beams, 9:3863 (RA;US)

**PIONEER SPACE PROBES**
**Gamma Detection**
Log N-log S is inconclusive, 9:3448 (R;US)

**PION-NUCLEON INTERACTIONS**
**Elastic Scattering**
Baryon spectroscopy, 9:3667 (RA;US)
**Experiment Planning**
Pion-nucleon physics at LAMPF II, 9:3668 (RA;US)
**Multiple Production**
Change of space-time characteristics of radiation region of secondary $\pi^-$-mesons produced in pion-nucleon interactions at 40 GeV/c on reference frame, 9:3631 (R;SU;In Russian)
**Particle Production**
Baryon spectroscopy, 9:3667 (RA;US)

**PIONS**
*See also PIONS PLUS*
**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)

**PIONS PLUS**
**Channeling**
$K^+/\mu^+$, $\pi^+/\mu^+$, and $\mu^+/e^+$ lattice steering in highly perfect crystals, 9:3964 (RA;US)
**Particle Production**
Energy variation of the analyzing power in the reaction p/sub pol/+p→d+$\pi^+$, 9:3728 (J;US)

**PIPELINES**
*See also ALASKA GAS PIPELINE*
New technologies for exploration and exploitation of oil and gas resources. Volume 1, 9:1823 (B;GB)
**Cost**
Long distance transport of LNG via cryogenic pipeline, 9:1897 (BA;GB)
**Design**
Castoro Sei introduces new standards of reliability and efficiency in pipelaying, 9:1895 (BA;GB)
Design and testing of a flexible line suitable for gas transportation, 9:1894 (BA;GB)
Long distance transport of LNG via cryogenic pipeline, 9:1897 (BA;GB)
**Field Tests**
General study and field testing of deep water submarine pipelines, 9:1861 (BA;GB)
**Installation**
General study and field testing of deep water submarine pipelines, 9:1861 (BA;GB)
Laying pipelines by the RAT method, 9:1860 (BA;GB)
Rigid flowline connecting and laying tests (Laying and coupling 8" flowline between 2 undersea structures submerged in 50m of water), 9:1857 (BA;GB)
**Materials**
Long distance transport of LNG via cryogenic pipeline, 9:1897 (BA;GB)
**Offshore Sites**
Castoro Sei introduces new standards of reliability and efficiency in pipelaying, 9:1895 (BA;GB)
Deep sea repair of pipelines by mechanical coupling, 9:1859 (BA;GB)
Design and testing of a flexible line suitable for gas transportation, 9:1894 (BA;GB)
General study and field testing of deep water submarine pipelines, 9:1861 (BA;GB)
Laying pipelines by the RAT method, 9:1860 (BA;GB)
Long distance transport of LNG via cryogenic pipeline, 9:1897 (BA;GB)
Production and operation of a full-scale testing loop for studying disphasic flows, 9:1856 (BA;GB)
Rigid flowline connecting and laying tests (Laying and coupling 8" flowline between 2 undersea structures submerged in 50m of water), 9:1857 (BA;GB)
Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding, 9:1893 (BA;GB)
Wide diameter flexible pipe with high performances and long lengths for great depths, 9:1858 (BA;GB)
**Performance Testing**
Design and testing of a flexible line suitable for gas transportation, 9:1894 (BA;GB)
**Pipes**
Wide diameter flexible pipe with high performances and long lengths for great depths, 9:1858 (BA;GB)
**Reliability**
Reliability analysis for stiff versus flexible piping (PWR; BWR), 9:2206 (R;US)
**Repair**
Deep sea repair of pipelines by mechanical coupling, 9:1859 (BA;GB)
Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding, 9:1893 (BA;GB)
**Sealing Materials**
Design and testing of a flexible line suitable for gas transportation, 9:1894 (BA;GB)
**Stress Analysis**
Reliability analysis for stiff versus flexible piping (PWR; BWR), 9:2206 (R;US)
**Testing**
Production and operation of a full-scale testing loop for studying disphasic flows, 9:1856 (BA;GB)
**Two-Phase Flow**
Production and operation of a full-scale testing loop for studying disphasic flows, 9:1856 (BA;GB)
**Welding**
Storage and transportation via pipeline: repair of pipelines by hyperbar or atmospheric pressure welding, 9:1893 (BA;GB)

**PIPES**
*See also DRILL PIPES*
**Flexibility**
Wide diameter flexible pipe with high performances and long lengths for great depths, 9:1858 (BA;GB)

**Performance**
Wide diameter flexible pipe with high performances and long lengths for great depths, 9:1858 (BA;GB)
**Two-Phase Flow**
Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3190 (R;AT;In German)
**PITTSBURG-MIDWAY SOLVENT REFINED COAL PRO**
*See SRC PROCESS*
**PLANT CELLS**
**Freezing**
Low temperature tolerance and cold hardening of cacti, 9:3382 (J;US)
**Necrosis**
Low temperature tolerance and cold hardening of cacti, 9:3382 (J;US)
**PLANT FOSSILS**
*See FOSSILS*
**PLANTS**
*See also ALGAE*
*CACTI*
*GRASS*
*MOSSES*
*SEAWEEDS*
*SHRUBS*
*TREES*
**Contamination**
Examination of the environmental half-time for radionuclides deposited on vegetation, 9:3299 (J;GB)
**Data Base Management**
Idaho National Engineering Laboratory vegetation data file, 9:3303 (RA;US)
**Radioactivity**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)
**Radiochemical Analysis**
$^{90}Sr$ and $^{137}Cs$ in soil and biota of fallout areas in southern Nevada and Utah, 9:3298 (J;GB)
**PLANTS (INDUSTRIAL)**
*See INDUSTRIAL PLANTS*
**PLANTS (POWER)**
*See POWER PLANTS*
**PLASMA**
*See also COLLISIONLESS PLASMA*
*EQUILIBRIUM PLASMA*
*HIGH-BETA PLASMA*
*HOT PLASMA*
*INHOMOGENEOUS PLASMA*
*LASER-PRODUCED PLASMA*
*LOW-BETA PLASMA*
*MEDIUM-BETA PLASMA*
*OPTICALLY THICK PLASMA*
*OPTICALLY THIN PLASMA*
**Alfven Waves**
Conversion of compressional Alfven waves into ion cyclotron waves in inhomogeneous magnetic fields, 9:4059 (R;JP)
**Ballooning Instability**
Ballooning modes in quadrupole tandem mirrors, 9:4105 (J;US)
Ballooning mode spectrum in general toroidal systems, 9:4113 (J;US)
**Bremsstrahlung**
Bremsstrahlung energy loss of degenerate plasma, 9:4164 (R;JP)
**Charge Exchange**
Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer, 9:4079 (J;US)
**Computer Calculations**
Computations in plasma physics, 9:4123 (J;US)
**Control**
Possible method for burn control by compression-decompression, 9:4063 (R;JP)
**Coulomb Field**
Numerical solution of the electron distribution function in tandem-mirror thermal barriers, 9:4094 (J;US)
Potentials in thermal barriers with strong electron-cyclotron heating, 9:4093 (J;US)
**Current-Drive Heating**
Beat-wave current drive in a magnetized plasma, 9:4048 (R;US)
**Distribution Functions**
Growth rate of the clump instability, 9:4088 (J;US)
Numerical solution of the electron distribution function in tandem-mirror thermal barriers, 9:4094 (J;US)
**Dynamics**
Electrostatic Kelvin—Helmholtz instability in a radially injected plasma cloud, 9:4101 (J;US)
**ECR Heating**
Linear and quasilinear theory of second electron cyclotron harmonic heating of tokamak plasmas, 9:4082 (J;US)
Numerical solution of the electron distribution function in tandem-mirror thermal barriers, 9:4094 (J;US)
Potentials in thermal barriers with strong electron-cyclotron heating, 9:4093 (J;US)
**Electric Conductivity**
Neoclassical flows and transport in nonaxisymmetric toroidal plasmas, 9:4087 (J;US)
Plasma heating with strong poloidal Ohmic currents, 9:4084 (J;US)
**Electric Currents**
Linear and quasilinear theory of second electron cyclotron harmonic heating of tokamak plasmas, 9:4082 (J;US)
**Electric Potential**
Scaling of oblique plasma double layers, 9:4086 (J;US)
**Electromagnetic Radiation**
Absorption of radiation propagating obliquely in a magnetoplasma, 9:4122 (J;US)
**Electron Density**
Far infrared heterodyne laser interferometer, 9:4070 (R;SU;In Russian)
**Electron Temperature**
Heat transport with cold and hot electrons allowing for flux limitation by Shvarts' method, 9:4197 (J;US)
**Emission Spectra**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Emission Spectroscopy**
Mass spectra and ionization temperatures in an argon-nitrogen inductively coupled plasma, 9:3603 (J;US)
**Energy Absorption**
Analytical approximations for the electron cyclotron absorption coefficient at the fundamental frequency in the Doppler regime, 9:4112 (J;US)
Quasilinear saturation effects on electron cyclotron wave damping of the ordinary mode in tokamak plasmas, 9:4081 (J;US)
**Energy Losses**
Bremsstrahlung energy loss of degenerate plasma, 9:4164 (R;JP)
**Equilibrium**
Stability of equilibria with helical magnetic axis, 9:4083 (J;US)
Survey of free-boundary ion ring equilibria, 9:4095 (J;US)
**Fluctuations**
Fluctuation and radiation processes in bounded plasma-molecular systems, 9:4069 (R;SU;In Russian)
Growth rate of the clump instability, 9:4088 (J;US)
Reduced magnetohydrodynamics and the Hasegawa—Mima equation, 9:4091 (J;US)
**Heat Transfer**
Heat transport with cold and hot electrons allowing for flux limitation by Shvarts' method, 9:4197 (J;US)
**Helmholtz Instability**
Electrostatic Kelvin—Helmholtz instability in a radially injected plasma cloud, 9:4101 (J;US)
**Impurities**
Viscosity-driven impurity transport in a stellarator, 9:4085 (J;US)
**Ion Density**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. I. Experiment, 9:3442 (J;US)

**Ion Temperature**
Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer, 9:4079 (J;US)
**Ionization**
Mass spectra and ionization temperatures in an argon-nitrogen inductively coupled plasma, 9:3603 (J;US)
Technique to increase the $H^+$ ion fraction in a multicusp source, 9:4099 (J;US)
**Joule Heating**
Plasma heating with strong poloidal Ohmic currents, 9:4084 (J;US)
**Lifetime**
Particle lifetime scaling in field-reversed configurations based on lower-hybrid-drift resistivity, 9:4080 (J;US)
**Lower Hybrid Heating**
Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks, 9:4104 (J;US)
**Magnetic Field Configurations**
Magnetic islands and turbulence, 9:4050 (R;FR;In French)
**Magnetic Flux**
Magnetic reconnection driven by the coalescence instability, 9:4089 (J;US)
**Magnetohydrodynamics**
Application of the stellarator expansion for plasma stability studies in stellarators, 9:4106 (J;US)
Magnetic reconnection driven by the coalescence instability, 9:4089 (J;US)
Reduced magnetohydrodynamics and the Hasegawa—Mima equation, 9:4091 (J;US)
Theory of mode-induced beam particle loss in tokamaks, 9:4111 (J;US)
**Mass Spectra**
Mass spectra and ionization temperatures in an argon-nitrogen inductively coupled plasma, 9:3603 (J;US)
**Neutral-Particle Transport**
Theory of mode-induced beam particle loss in tokamaks, 9:4111 (J;US)
**Nonlinear Problems**
Magnetic reconnection driven by the coalescence instability, 9:4089 (J;US)
Reduced magnetohydrodynamics and the Hasegawa—Mima equation, 9:4091 (J;US)
Scaling of oblique plasma double layers, 9:4086 (J;US)
**Oscillation Modes**
Theory of mode-induced beam particle loss in tokamaks, 9:4111 (J;US)
**Photon Emission**
Fluctuation and radiation processes in bounded plasma-molecular systems, 9:4069 (R;SU;In Russian)
**Plasma Density**
Technique to increase the $H^+$ ion fraction in a multicusp source, 9:4099 (J;US)
**Plasma Drift**
Neoclassical flows and transport in nonaxisymmetric toroidal plasmas, 9:4087 (J;US)
**Plasma Instability**
Growth rate of the clump instability, 9:4088 (J;US)
Instability of fusing plasmas and spin-depolarization processes, 9:4119 (J;US)
Magnetic reconnection driven by the coalescence instability, 9:4089 (J;US)
**Plasma Waves**
Weak cubic Langmuir turbulence, 9:4102 (J;US)
**Polarization**
Fusion reactor plasmas with polarized nuclei, 9:4128 (BA;XA)
**Radiowave Radiation**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. I. Experiment, 9:3442 (J;US)
**Refractivity**
Analytical approximations for the electron cyclotron absorption coefficient at the fundamental frequency in the Doppler regime, 9:4112 (J;US)
**Rotation**
Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer, 9:4079 (J;US)
**Scaling Laws**
Particle lifetime scaling in field-reversed configurations based on lower-hybrid-drift resistivity, 9:4080 (J;US)
**Spin Flip**
Instability of fusing plasmas and spin-depolarization processes, 9:4119 (J;US)
**Stability**
Stability of equilibria with helical magnetic axis, 9:4083 (J;US)
**Transport Theory**
Neoclassical flows and transport in nonaxisymmetric toroidal plasmas, 9:4087 (J;US)
**Turbulence**
Magnetic islands and turbulence, 9:4050 (R;FR;In French)
Weak cubic Langmuir turbulence, 9:4102 (J;US)
**Ultraviolet Spectra**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Viscosity**
Viscosity-driven impurity transport in a stellarator, 9:4085 (J;US)
**Visible Spectra**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Wall Effects**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**X-Ray Spectra**
Pulsed plasma source spectrometry in the 80—8000-eV x-ray region, 9:4096 (J;US)

**PLASMA CONFINEMENT**
*See also INERTIAL CONFINEMENT*
**Confinement Time**
Experimental studies of field-reversed configuration confinement in FRX-C, 9:4131 (BA;XA)

**PLASMA DENSITY**
**Variations**
Rayleigh—Taylor instability in an inhomogeneous ablatively accelerated fluid, 9:4109 (J;US)

**PLASMA DIAGNOSTICS**
**Calorimeters**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Cameras**
Mass-ablation rates in a spherical laser-produced plasma, 9:4195 (J;US)
**Far Infrared Radiation**
FIR laser-development program. Final report, 9:4041 (R;US)
**Image Processing**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Image Scanners**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Interferometers**
Far infrared heterodyne laser interferometer, 9:4070 (R;SU;In Russian)
**Interferometry**
Experimental study of high-beta tokamak stability, 9:4118 (J;US)
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)
**Research Programs**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Spectrometers**
Measurements of plasma ion temperature and rotation velocity using the He II 4686-A line produced by charge transfer, 9:4079 (J;US)
**Spectroscopy**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**Thomson Scattering**
Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4051 (R;FR;In French)

**Uses**
Plasma spectral analysis using an image dissecting detector, 9:4097 (J;US)
**X-Ray Spectrometers**
Imaging x-ray spectrometer for laser fusion applications, 9:4138 (J;US)
**X-Ray Spectroscopy**
Pulsed plasma source spectrometry in the 80—8000-eV x-ray region, 9:4096 (J;US)
Use of sharp autoionizing resonances for soft x-ray diagnosis of inertially confined fusion plasmas, 9:4137 (J;US)

**PLASMA FILAMENT**
**Ballooning Instability**
Transport factors due to the dissipative ballooning models, 9:4053 (R;SU;In Russian)

**PLASMA HEATING**
*See also BEAM INJECTION HEATING*
*HIGH-FREQUENCY HEATING*
Equilibrium, stability and heating of plasmas in linear and toroidal Extrap pinches, 9:4126 (BA;XA)

**PLASMA INSTABILITY**
**Electromagnetic Radiation**
Instability of fusing plasmas and spin-depolarization processes, 9:4119 (J;US)
**Perturbation Theory**
Order of the linear instability of a plasma, 9:4124 (J;US)
**Plasmons**
Inhomogeneous two-plasmon instability, 9:4116 (J;US)

**PLASMA OSCILLATIONS**
*See PLASMA WAVES*

**PLASMA (QUARK)**
*See QUARK MATTER*

**PLASMA SHEATH**
**Mathematical Models**
Applications of hybrid numerical-simulation methods to magnetic-confinement systems, 9:4046 (R;US)

**PLASMA SIMULATION**
**Boundary Layers**
Models and codes for the plasma edge region (Zephyr code), 9:4038 (R;GB)
**Field Equations**
Direct implicit large time-step particle simulation of plasmas, 9:4121 (J;US)
**Iterative Methods**
Direct implicit large time-step particle simulation of plasmas, 9:4121 (J;US)

**PLASMA WAVES**
**Dispersion Relations**
Dispersion relation for a relativistic electron beam in a plasma, 9:4115 (J;US)
**Research Programs**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)

**PLASMONS**
**Dispersion Relations**
Plasmons in the interphase between two metals, 9:2688 (RA;BR;In Portuguese)

**PLATES (FUEL)**
*See FUEL PLATES*

**PLATINUM**
**Absorption Spectra**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Auger Electron Spectroscopy**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
Experimental study of the oscillatory behavior of CO oxidation on $Pt/Al_2O_3$ by in situ infrared transmission spectroscopy, 9:3053 (D;US)
**Encapsulation**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**Molecule Collisions**
Distribution of internal energy in CO and $CO_2$ vibrationally excited by a hot platinum surface, 9:3581 (J;US)
**Multi-Element Analysis**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Sorptive Properties**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Surface Properties**
NMR study of platinum catalysts, 9:2756 (J;NL)

**PLATINUM 192 TARGET**
**Nitrogen 14 Reactions**
High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3926 (J;US)

**PLATINUM 194 TARGET**
**Nitrogen 14 Reactions**
High-spin states in /sup 201,203/At and the systematic behavior of Z = 85 isotopes, 9:3926 (J;US)

**PLATINUM 195**
**Nuclear Magnetic Resonance**
NMR study of platinum catalysts, 9:2756 (J;NL)

**PLATINUM 197**
**Isomeric Transitions**
Decay of 399 KeV isomeric state in $^{197}$Pt. A possible candidate for PAC studies, 9:3920 (R;BR)

**PLATINUM ALLOYS**
**Electronic Structure**
Electronic structure of metallic alloys through Auger and photoemission spectroscopy, 9:2687 (RA;BR)

**PLATINUM CARBIDES**
**Photolysis**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)

**PLATINUM COMPLEXES**
**Chemical Bonds**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of $\gamma$(OHO) vs R (OO), 9:3969 (J;US)
**Chemical Reaction Yield**
Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2920 (J;US)
**Chemical Reactions**
Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2920 (J;US)
**Chemisorption**
Coordination chemistry of benzene, toluene, cyclohexadienes, cyclohexene, and cyclohexane on Pt(100), 9:2961 (J;US)
**Neutron Diffraction**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of $\gamma$(OHO) vs R (OO), 9:3969 (J;US)
**Structural Chemical Analysis**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of $\gamma$(OHO) vs R (OO), 9:3969 (J;US)
Mechanism of molecular A-frame formation by methylene insertion into a platinum-platinum bond, 9:2920 (J;US)

**PLATINUM ISOTOPES**
*See also PLATINUM 195*
*PLATINUM 197*
**Energy Levels**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)

**PLATINUM OXIDES**
**Photochemical Reactions**
Photoreactions and photoelectrochemical effects in supported multilayer assemblies. Mechanisms of interfacial reactions involving reactive supports, metalloporphyrin surface films, and solutions, 9:3022 (J;US)

**PLESIOTHERAPY**
*See RADIOTHERAPY*

**PLT DEVICES**
**ICR Heating**
High-power ICRF and ICRF plus neutral-beam heating on PLT, 9:4125 (BA;XA)
**Neutral Atom Beam Injection**
Neutral beam injector performance on the PLT and PDX tokamaks, 9:4139 (BA;GB)

**PLUMES**
**Remote Sensing**
Eye-safe tracking of oil fog plumes by UV lidar, 9:3271 (J;US)

**PLUTO REACTOR**
**Fuel Elements**
Note on current position regarding the development by the UKAEA of reduced enrichment fuels for research and test reactors, 9:2359 (RA;US)

**PLUTONIUM**
**Combustion**
Comments on the note by L.S. Nelson: "unusually high (oxidizer/Pu) ratios in the macro-residues from plutonium droplet combustion", 9:1933 (J;US)
Reply to the comments by M.D. Allen and L.G. Morgan, 9:1934 (J;US)
**Isotope Ratio**
Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis, 9:1921 (R;GB)
**Mass Spectroscopy**
Use of the Isomass 54E thermal ionisation mass spectrometer at AEE Winfrith. Part II: plutonium analysis, 9:1921 (R;GB)
**Measuring Methods**
Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment, 9:1994 (R;US)
**Processing**
Chemical processing monthly report, 9:1931 (R;US)
Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982, 9:1930 (R;US)
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)
**Recovery**
Acid digestion of Pu-containing waste. Process development and Pu-recovery, 9:1945 (R;XE;In German)

**PLUTONIUM 237**
**Intestinal Absorption**
The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3397 (J;US)

**PLUTONIUM 238**
**Intestinal Absorption**
The effect of x rays, DTPA, and aspirin on the absorption of plutonium from the gastrointestinal tract of rats, 9:3396 (J;US)
**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**PLUTONIUM 239**
**Criticality**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fisale material, 9:3075 (B;US)
**Heavy Ion Reactions**
Energy dependence of GITAsub(n)/GITAsub(f) partial widths ratio of neutron emission to fission for transuranium nuclei, 9:3931 (R;SU;In Russian)
**Intestinal Absorption**
The effect of mass on the gastrointestinal absorption of plutonium and neptunium, 9:3397 (J;US)
**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**PLUTONIUM 240**
**Isotope Production**
Transuranium-element processing, 9:3037 (RA;US)
**Radioecological Concentration**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**PLUTONIUM 241**
**Retention Functions**
Tissue, cellular, and subcellular distribution of $^{241}$Pu in the rat testes, 9:3395 (J;US)
**Tissue Distribution**
Tissue, cellular, and subcellular distribution of $^{241}$Pu in the rat testes, 9:3395 (J;US)

**PLUTONIUM 242**
**Muonic Atoms**
Study of fission dynamics by muon-induced fission, 9:3932 (RA;US)

**PLUTONIUM 242 TARGET**
**Muon Reactions**
Study of fission dynamics by muon-induced fission, 9:3932 (RA;US)

**PLUTONIUM COMPOUNDS**
**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)

**PLUTONIUM DIOXIDE**
**Enthalpy**
Thermophysical properties of reactor fuels, 9:1926 (BA;US)

**PLUTONIUM ISOTOPES**
*See also PLUTONIUM 237*
*PLUTONIUM 238*
*PLUTONIUM 239*
*PLUTONIUM 240*
*PLUTONIUM 241*
*PLUTONIUM 242*
**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)

**PLUTONIUM RECYCLE**
Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings, 9:2197 (R;XE)
**Research Programs**
Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report, 9:2196 (R;XE;In French)

**PNA**
*See POLYCYCLIC AROMATIC HYDROCARBONS*

**POINT CONTACTS**
*See ELECTRIC CONTACTS*

**POISONS (CHEMICAL)**
*See HAZARDOUS MATERIALS*

**POLAR COMPOUNDS**
**Correlation Functions**
Perturbation theories for the dipolar fluids, 9:2944 (J;US)

**POLAR REGIONS**
*See also ARCTIC REGIONS*
**Air Pollution**
Atmospheric Bromine in the Arctic, 9:3270 (J;US)

**POLARONS**
**Oscillation Modes**
Charged particle interaction with the oscillation modes of a surface, 9:3527 (RA;BR;In Portuguese)

**POLICY**
*See ENERGY POLICY*

**POLLUTION REGULATIONS**
*Regulations for nonradioactive pollution only; see also CONTAMINATION REGULATIONS.*

**Economic Impact**
Economic impact of acid rain legislation on Illinois, 9:2537 (R;US)

**POLOIDAL DIVERTOR EXPERIMENT**
*See PDX DEVICES*

**POLOIDAL DIVERTORS**
*A divertor which takes out poloidal magnetic field lines, forming a separatrix in the poloidal field.*
**Specifications**
Survey of fusion reactor technology. Development of design technology for the magnet system of Tokamak fusion reactor, 9:4176 (R;KR;In Korean)

**POLONIUM**
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)

**POLYACRYLONITRILE**
*See ORGANIC POLYMERS*

**POLYAMIDES**
*See also POLYURETHANES*
**Chemical Radiation Effects**
Synthesis and ion exchange properties of grafted poly(p-phenylene terephthalamide) (Gamma rays), 9:1914 (B;ZA)

**POLYATOMIC MOLECULES**
**Chemical Reaction Kinetics**
Reaction-path dynamics for polyatomic systems, 9:3557 (J;US)
**Collisions**
Reaction-path dynamics for polyatomic systems, 9:3557 (J;US)
**Oscillation Modes**
Unimolecular and bimolecular reactions in the $C_4H_8$/sup +center-dot/ system: Experiment and theory, 9:3577 (J;US)
**Vibrational States**
Unimolecular and bimolecular reactions in the $C_4H_8$/sup +center-dot/ system: Experiment and theory, 9:3577 (J;US)

**POLYCYCLIC AROMATIC AMINES**
**Biological Accumulation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Biological Effects**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Liquid Column Chromatography**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Metabolic Activation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Photochemical Reactions**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**POLYCYCLIC AROMATIC HYDROCARBONS**
*See also 3-METHYLCHOLANTHRENE*
**Hydrocracking**
Hydrocracking polycyclic hydrocarbons over a dual-functional zeolite (faujasite)-based catalyst, 9:2980 (J;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids, 9:1811 (R;US)
**Photochemistry**
Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system, 9:3017 (J;US)
**Quantitative Chemical Analysis**
Analytical chemistry of polycyclic aromatic hydrocarbons present in coal-fired power plant fly ash, 9:2884 (R;US)
**Structural Chemical Analysis**
Photochemical transformations. 32. Stereochemical course and stereochemical requirement for activation of photosolvolysis and photorearrangements in a chlorobenzobicyclo[2.2.2]octadienyl system, 9:3017 (J;US)

**POLYCYCLIC NITRO COMPOUNDS**
**Biological Accumulation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Biological Effects**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Carcinogen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Liquid Column Chromatography**
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Metabolic Activation**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
**Mutagen Screening**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)
Phototransformation of polycyclic aromatic hydrocarbons into stable, mutagenic components, 9:3411 (R;US)
**Reviews**
Heteroatomic polycyclic aromatic hydrocarbons in coal liquids. Rev., 9:3414 (R;US)

**POLYCYCLIC NITROGEN HETEROCYCLES**
*See AZAARENES*

**POLYENES**
*See also DIENES*
**Fluorescence Spectroscopy**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)
**Photochemical Reactions**
Photoprocesses in diphenylpolyenes. 2. Excited-state interactions with stable free radicals, 9:3002 (J;US)

**POLYETHYLENES**
*See also POLYTETRAFLUOROETHYLENE*
**Chemical Radiation Effects**
Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3030 (J;US)
**Conformational Changes**
Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks, 9:2808 (J;US)
**Elasticity**
Non-Gaussian theory of rubberlike elasticity based on rotational isomeric state simulations of network chain configurations. I. Polyethylene and polydimethylsiloxane short-chain unimodal networks, 9:2808 (J;US)
**Nucleate Boiling**
Nucleate boiling in drag-reducing polymer solutions, 9:3084 (J;US)
**Phase Transformations**
Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3030 (J;US)

**POLY(ISOBUTYLENE OXIDE)**
*See ORGANIC POLYMERS*

**POLYMER FLOODING**
*See MICROEMULSION FLOODING*
*WATERFLOODING*

**POLYMERS**
*See also ELASTOMERS*
*ORGANIC POLYMERS*
**Chemical Reaction Kinetics**
Irreversible random and cooperative processes on lattices: Exact and approximate hierarchy truncation and solution, 9:2809 (J;US)

Irreversible reaction on a polymer chain with range two cooperative effects, 9:2810 (J;US)
**Dielectric Properties**
Ferroelectricity of polymers, 9:2807 (RA;BR)
**Mechanical Properties**
Design and testing of a flexible line suitable for gas transportation (Rilsan and silastene), 9:1894 (BA;GB)
**Nucleate Boiling**
Nucleate boiling in drag-reducing polymer solutions, 9:3084 (J;US)

**POLYNUCLEAR AROMATIC HYDROCARBONS**
*See POLYCYCLIC AROMATIC HYDROCARBONS*

**POLYSACCHARIDES**
*See also CELLULOSE*
**Nucleate Boiling**
Nucleate boiling in drag-reducing polymer solutions, 9:3084 (J;US)
**Structural Chemical Analysis**
Host-guest interactions in amylose inclusion complexes: photochemistry of surfactant stilbenes in helical cavities of amylose, 9:2991 (J;US)

**POLYSTYRENE**
**Radiolysis**
Radiolysis of resist polymers. IV. Poly(p-substituted-alpha-methylstyrenes). Technical report, 9:3024 (R;US)

**POLYSULFIDES**
*See SULFIDES*

**POLYTETRAFLUOROETHYLENE**
**Moessbauer Effect**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)
**X-Ray Spectroscopy**
EXAFS and Moessbauer studies of iron neutralized Nafion ionomers, 9:2973 (J;US)

**POLYTETRAOXANE**
*See HETEROCYCLIC OXYGEN COMPOUNDS*
*ORGANIC POLYMERS*

**POLYTHENE**
*See POLYETHYLENES*

**POLYTHIONATES**
*See SULFUR COMPOUNDS*

**POLYTHIONIC ACIDS**
*See INORGANIC ACIDS*
*SULFUR COMPOUNDS*

**POLYURETHANES**
**Radiation Chemistry**
Radiation induced modification of polyurethane for biomedical applications, 9:3026 (R;DE;In German)

**POMERANCHUK PARTICLES**
**Propagator**
Reggeon field theory at D = 2 in two-loop approximation, 9:3738 (R;SU)
**Threshold Energy**
Renormalizability of reggeon field theory with account of thresholds and mass terms at D = 2, 9:3737 (R;SU)

**POMERONS**
*See POMERANCHUK PARTICLES*

**PONDS**
**Radionuclide Migration**
Residence time, dispersal, and harvest of waterfowl using a radioactive leaching pond in southeastern Idaho, 9:3332 (RA;US)
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

**POOLS**
*See PONDS*

**POPULATION DYNAMICS**
**Mathematical Models**
Robust analysis of aggregation error, 9:3343 (J;US)

**POPULATION INVERSION**
**Coherent Radiation**
Broadband population inversion, 9:4024 (J;US)
**Modulation**
Broadband population inversion by phase modulated pulses, 9:4017 (J;US)

**POPULATIONS**
*See also HUMAN POPULATIONS*
**Biological Radiation Effects**
Radioecology: nuclear energy and the environment, 9:3300 (B;US)

**POROUS MATERIALS**
**Wave Propagation**
Theory of pulse propagation in fluid-saturated porous layers, 9:4015 (R;US)

**PORPHYRINS**
*See also CHLOROPHYLL*
*MYOGLOBIN*
**Chemical Bonds**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)
**Dimerization**
ESR study of cation-crown ether induced dimerization of a water-soluble porphyrin, 9:2067 (J;US)
**Electron Spin Resonance**
ESR study of cation-crown ether induced dimerization of a water-soluble porphyrin, 9:2067 (J;US)
**Excitation**
ESR study of cation-crown ether induced dimerization of a water-soluble porphyrin, 9:2067 (J;US)
**Perturbed Angular Correlation**
Perturbed angular correlation studies of indium metalloporphyrin complexes, 9:2975 (J;US)
**Photochemical Reactions**
Photoreactions and photoelectrochemical effects in supported multilayer assemblies. Mechanisms of interfacial reactions involving reactive supports, metalloporphyrin surface films, and solutions, 9:3022 (J;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)

**PORTUGAL**
**Bilateral Agreements**
Agreement on scientific and technical co-operation in the peaceful uses of nuclear energy between the National Laboratory of Industrial Engineering and Technology (LNETI) and the Commissariat a l'Energie Atomique (CEA), 9:2546 (R;PT;In Portuguese)
Protocol between the National Laboratory of Industrial Engineering and Technology of Portugal and the Junta de Energia Nuclear of Spain on supply and transfer of technology on uranium extraction from phosphoric acid, 9:1913 (R;PT;In Portuguese)
Scientific cooperation agreement on an investigation and surveillance programme on the site for radioactive waste disposal in the North-East Atlantic between the Nuclear Research Centre (CEN), Belgium and the National Laboratory of Industrial Engineering and Technology (LNETI), Portugal, 9:1985 (R;PT;In Portuguese)

**POSITIVE IONS**
*See CATIONS*

**POSITRON BEAMS**
**Beam Production**
Low energy positron production at the Livermore linac, 9:3126 (J;US)

**POSITRON COLLISIONS**
**Diffraction**
Differences between positrons and electrons in elastic and inelastic processes at surfaces, 9:3508 (R;US)

**POSITRONIUM**
**Hyperfine Structure**
Present state of quantum electrodynamics, 9:3830 (RA;SU;In Russian)

**POSITRONS**
**Annihilation**
Low-temperature positron annihilation, 9:3460 (R;US)

**POTASSIUM**
**Adsorption**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)
**Auger Electron Spectroscopy**
Interaction of potassium with $\pi$-electron orbital containing molecules on Pt(111), 9:2926 (J;US)

**Desorption**
Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces, 9:2963 (J;US)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**POTASSIUM 40**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**POTASSIUM BROMIDES**
**Crystal Structure**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**Crystal-Phase Transformations**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**Neutron Diffraction**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**POTASSIUM CARBIDES**
**Photolysis**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**POTASSIUM COMPLEXES**
**Chemical Bonds**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO), 9:3969 (J;US)
**Neutron Diffraction**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO), 9:3969 (J;US)
**Structural Chemical Analysis**
Inelastic neutron scattering studies of some intramolecular hydrogen bonded complexes: A new correlation of γ(OHO) vs R (OO), 9:3969 (J;US)
**POTASSIUM COMPOUNDS**
*See also POTASSIUM BROMIDES*
*POTASSIUM CARBIDES*
**Crystal Structure**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**Crystal-Phase Transformations**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**Neutron Diffraction**
Neutron powder diffraction study of phase transitions and structures of (KCN)/sub x/(KBr)/sub 1-x/ mixed crystals, 9:2846 (J;US)
**POTENTIAL SCATTERING**
**Bound State**
Group theory approach to scattering, 9:3850 (J;US)
**Group Theory**
Group theory approach to scattering, 9:3850 (J;US)
**Phase Space**
Quantum collision theory with phase-space distribution functions, 9:4027 (J;US)
**POWER BURST FACILITY USAEC**
*See PBF REACTOR*
**POWER DISTRIBUTION**
**L Codes**
Power distribution and fuel depletion calculation for a PWR, using LEOPARD and CITATION codes, 9:2235 (B;BR;In Portuguese)
**POWER PLANT AND INDUSTRIAL FUEL USE ACT**
Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada, 9:2185 (R;US)
**POWER PLANTS**
*See also DUAL-PURPOSE POWER PLANTS*
*FUEL CELL POWER PLANTS*
*HYDROELECTRIC POWER PLANTS*
*THERMONUCLEAR POWER PLANTS*
*WIND POWER PLANTS*
**Site Selection**
Regulation and system interdependence: effects on the siting of California electrical energy facilities, 9:2567 (R;US)
**POWER REACTORS**
*See also ARKANSAS-1 REACTOR*
*ARKANSAS-2 REACTOR*
*ATUCHA REACTOR*
*BELOYARSK-3 REACTOR*
*BOR-60 REACTOR*
*BROWNS FERRY-1 REACTOR*
*BROWNS FERRY-2 REACTOR*
*BROWNS FERRY-3 REACTOR*
*BRUCE-1 REACTOR*
*CLINCH RIVER BREEDER REACTOR*
*JATR REACTOR*
*JOYO REACTOR*
*LOVIISA-1 REACTOR*
*LOVIISA-2 REACTOR*
*PFR REACTOR*
*PHENIX REACTOR*
*PICKERING-1 REACTOR*
*RHEINSBERG AKW1 REACTOR*
*SNR-1 REACTOR*
*SPACE POWER REACTORS*
*THREE MILE ISLAND-1 REACTOR*
*THREE MILE ISLAND-2 REACTOR*
*THTR-300 REACTOR*
*VHTR REACTOR*
*WAGR REACTOR*
**Electric Motors**
Design criteria for rotating machinery to withstand fast electric bus transfer, 9:2328 (RA;CA)
**Fuel Management**
Core design with respect to the safety concept, 9:2430 (R;DE)
**Meltdown**
Systemic event tree methodolgoy employed in the Interim Reliability Evaluation Program (IREP), 9:2492 (BA;US)
**Reactor Accidents**
Fission product behavior and containment response models for use in PRA studies, 9:2490 (BA;US)
Realistic estimates of the consequences of nuclear accidents, 9:2424 (RA;CA)
**Reactor Cores**
Core design with respect to the safety concept, 9:2430 (R;DE)
**Reactor Safety**
Core design with respect to the safety concept, 9:2430 (R;DE)
**Risk Assessment**
Core design with respect to the safety concept, 9:2430 (R;DE)
Development and organization of the industry/NRC procedures guide, 9:2487 (BA;US)
Variance reduction in simulation, 9:2486 (BA;US)
**POWER SUPPLIES**
*See also PHOTOVOLTAIC POWER SUPPLIES*
**Optimization**
Optimized rotary flux compressors for powering laser flashlamps, 9:4190 (R;US)
**Stabilization**
Stabilized high voltage power supply of proportional and drift chambers, 9:3177 (R;SU;In Russian)
**POWER SYSTEMS**
*Includes electric power networks with associated generating and transmission facilities.*
**Control Systems**
Multivariable control for electric-generating plants, September 1978-February 1982, 9:2562 (R;US)
**Efficiency**
Large-scale-system effectiveness analysis, 9:2561 (R;US)
**Reliability**
Large-scale-system effectiveness analysis, 9:2563 (R;US)
**Stability**
Stochastic stability research for complex power systems, 9:2560 (R;US)
**POWER TRANSMISSION**
**Computerized Control Systems**
Digital substation control systems in the electricity supply. System description, 9:2191 (R;NO;In Norwegian)

**POWER TRANSMISSION LINES**
**Environmental Effects**
Raptor electrocutions on the Idaho National Engineering Laboratory (Aquila chrysaetos, Buteo lagopus, Buteo jamaicensis, Bubo virginianus, Falco sparverius, Falco mexicanus, Buteo regalis), 9:3426 (RA;US)

**POWER TRANSMISSION TOWERS**
**Corrosion**
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)

**POWER-COOLING-MISMATCH ACCIDENTS**
**Test Facilities**
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)

**PRECOMPOUND-NUCLEUS EMISSION**
**Testing**
Global test of modified precompound decay models, 9:3924 (J;US)

**PREEQUILIBRIUM NUCLEAR PROCESSES**
*See PRECOMPOUND-NUCLEUS EMISSION*

**PREGNANCY**
**Blood Serum**
Interference factors in digoxin analysis, especially in the serum of pregnant women, by RIA. Clinical aspects, methods, comparative studies using different RIA techniques, 9:3353 (R;DE;In German)

**PRESSURE (VAPOR)**
*See VAPOR PRESSURE*

**PRESSURE VESSELS**
**Densimeters**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Dynamic Loads**
Determination of local and time-dependent pressure curves after sudden relief of pressure on containers and container combinations, 9:2329 (B;DE;In German)
**Embrittlement**
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Failures**
High pressure melt ejection, 9:2449 (R;US)
**Fracture Mechanics**
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)
**Fracture Properties**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
**Level Indicators**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Physical Radiation Effects**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Pressure Release**
Determination of local and time-dependent pressure curves after sudden relief of pressure on containers and container combinations, 9:2329 (B;DE;In German)
**Thermal Shock**
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)

**PRESSURIZED HEAVY WATER COOLED MODERATED**
*See PHWR TYPE REACTORS*

**PRESSURIZED WATER COOLED MODERATED REACTO**
*See PWR TYPE REACTORS*

**PRESSURIZED WATER REACTORS**
*See PWR TYPE REACTORS*

**PRESSURIZERS**
**Simulation**
Model to simulate the dynamic of a PWR pressurizer using the CSMP program, 9:2236 (B;BR;In Portuguese)
**Thermodynamic Model**
Model to simulate the dynamic of a PWR pressurizer using the CSMP program, 9:2236 (B;BR;In Portuguese)

**PRESTRESSED CONCRETE**
**Acoustic Emission Testing**
Investigations on the monitoring of structural integrity and fault location for civil engineering prestressed concrete structures by acoustic emission analysis, 9:3094 (R;AT;In German)

**PRICING REGULATIONS**
**Enforcement**
State and local responses to natural gas price increases, 9:2553 (R;US)

**PRIMARY COOLANT CIRCUITS**
*See also COOLANT CLEANUP SYSTEMS*
**Fluid Mechanics**
Reduction of numerical diffusion errors in thermal mixing predictions, 9:2232 (J;US)
**Heat Transfer**
Reduction of numerical diffusion errors in thermal mixing predictions, 9:2232 (J;US)
**Hydraulics**
Reduction of numerical diffusion errors in thermal mixing predictions, 9:2232 (J;US)
**Hydrodynamics**
Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2198 (R;SU;In Russian)
**Reactor Simulators**
The design, construction, and operation of a working PWR primary loop simulator, 9:2225 (J;US)
**Stability**
Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2198 (R;SU;In Russian)
**Test Facilities**
The design, construction, and operation of a working PWR primary loop simulator, 9:2225 (J;US)
**Two-Phase Flow**
Technique for calculating stationary and dynamic regimes in a nuclear power plant coolant circuit with coolant boiling, 9:2198 (R;SU;In Russian)

**PRINCETON LARGE TORUS**
*See PLT DEVICES*

**PROCESS HEAT REACTORS**
**Fuel Assemblies**
Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant, 9:2314 (J;US)
**Fuel Cycle**
Selection of LEU/Th reference fuel for the HTGR-SC/C lead plant, 9:2314 (J;US)
**Power Generation**
Application of the HTGR in tar sands oil recovery, 9:1902 (RA;CA)
**Process Heat**
Application of the HTGR in tar sands oil recovery, 9:1902 (RA;CA)

**PROCESS SOLUTIONS**
**Chemical Analysis**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)

**PROCESSING (DATA)**
*See DATA PROCESSING*

**PROCUREMENT**
**Administrative Procedures**
Questionable practices in the selection of transportation services for small lots of hazardous or sensitive cargo, 9:2528 (R;US)

**PRODUCTION (HYDROGEN)**
*See HYDROGEN PRODUCTION*

**PRODUCTION (ISOTOPE)**
*See ISOTOPE PRODUCTION*
**PRODUCTION REACTORS**
*For the production of fissile materials only; see also IRRADIATION REACTORS.*
**Thermal Pollution**
Thermal-effects study, 9:2342 (R;US)
**PROFESSIONAL PERSONNEL**
**Certification**
Certification and qualification of suppliers and personnel for the Argentine nuclear program, 9:2307 (J;US)
**Training**
The program of cooperation between the King Abdulaziz University and the Swiss Federal Institute of Technology in the field of nuclear education and training, 9:2477 (J;US)
**PROGRAMMING**
*Limited to computer programming.*
**Standardization**
COBOL programming standards at Sandia Labs, 9:4243 (R;US)
**PROJECTION SPARK CHAMBERS**
Neutrino physics at LAMPF II with a liquid time projection chamber detector, 9:3678 (RA;US)
**Design**
Liquid time projection chamber, 9:3187 (RA;US)
**PROMETHIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**PRONGS**
*See PARTICLE TRACKS*
**PROPANE**
**Critical Temperature**
Electron attachment to oxygen in supercritical hydrocarbon fluids, 9:2976 (J;US)
**Quantitative Chemical Analysis**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**Quantity Ratio**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**1-PROPANOL**
*See PROPANOLS*
**2-PROPANOL**
*See PROPANOLS*
**PROPANOLS**
**Photolysis**
Infrared laser induced heterogeneous reactions: 2-propanol with cupric oxide, 9:3020 (J;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)
**PROPENE**
*See PROPYLENE*
**PROPYL ALCOHOLS**
*See PROPANOLS*
**PROPYLENE**
**Chemical Reactions**
Iron/alkene reactions: a matrix isolation infrared and Moessbauer investigation, 9:2922 (J;US)
**PROTECTION**
*See SAFETY*
**PROTECTION (RADIATION)**
*See RADIATION PROTECTION*
**PROTON DETECTION**
**Heavy Liquid Bubble Chambers**
Simple method of energy and emission angle determination of protons registeres in heavy liquid bubble chambers, 9:3183 (R;SU;In Russian)
**PROTON REACTIONS**
**Capture**
Effects of the $^3$He D state in the reaction $^3$H(p,γ)$^3$He, 9:3867 (J;US)
Energy variation of the analyzing power in the reaction p/sub pol/+p→d+$\pi^+$, 9:3728 (J;US)
Giant dipole resonances built on excited states, 9:3885 (R;US)
Nucleosynthesis of $^{26}$Al at low stellar temperatures, 9:3484 (J;US)
Rate of the $^3$He(p, $e^+\nu$)$^4$He reaction, 9:3474 (J;US)
**Charge-Exchange Reactions**
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**Compound-Nucleus Reactions**
Identification of $^{233}$Ac, 9:3935 (J;US)
**Cross Sections**
Cross sections of nuclear reactions induced by protons, deuterons, and alpha particles. Pt.8 Chlorine, 9:3884 (R;FR;In French)
**Elastic Scattering**
Configuration space Faddeev continuum calculations: p-d s-wave scattering length, 9:3868 (J;US)
Energy dependence of the relativistic impulse approximation for proton-nucleus elastic scattering, 9:3889 (J;US)
**Fragmentation**
Fragment emission in high-energy proton-nucleus interactions, 9:3923 (RA;US)
Nuclear fragmentation by relativistic $K^{+-}$, anti p, $\pi^{+-}$, and p projectiles, 9:3922 (RA;US)
**Inclusive Interactions**
Inclusive production of direct photons in 200-GeV/c collisions, 9:3719 (J;US)
**Inelastic Scattering**
Observation of 2hω hexadecapole strength in lead nuclei from 200 MeV inelastic proton scattering, 9:3927 (J;US)
Studies of spin excitations with electromagnetic and hadronic probes, 9:3898 (R;US)
**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)
Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3727 (J;US)
**Precompound-Nucleus Emission**
Global test of modified precompound decay models, 9:3924 (J;US)
**Spallation**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
Nuclei far from stability produced by high-energy protons, 9:3895 (RA;US)
**PROTON-ANTIPROTON INTERACTIONS**
**Annihilation**
p anti p → $l^+l^-$: a LAMPF II proposal, 9:3656 (RA;US)
**Experiment Planning**
p anti p → $l^+l^-$: a LAMPF II proposal, 9:3656 (RA;US)
Search for mesons in the mass range 2.5 to 5 GeV/$c^2$, 9:3658 (RA;US)
Studies of anti NN polarization experiments at LAMPF II, 9:3657 (RA;US)
**Inclusive Interactions**
Polarization as a tool for studying the physics of weak interactions, 9:3733 (RA;XC)
**Jet Model**
Hard scattering and jet physics in connection with real photons, 9:3617 (RA;XC)
**Nucleon-Nucleon Potential**
Spin dependence in N anti N at low energy, 9:3762 (R;FR)
**Polarized Beams**
Studies of anti NN polarization experiments at LAMPF II, 9:3657 (RA;US)
**Polarized Targets**
Studies of anti NN polarization experiments at LAMPF II, 9:3657 (RA;US)
**Spin**
Spin dependence in N anti N at low energy, 9:3762 (R;FR)
**Total Cross Sections**
New ISR and collider anti p-p and p-p data and asymptotic theorems, 9:3626 (R;FR)
**PROTON-NUCLEON INTERACTIONS**
*See also PROTON-PROTON INTERACTIONS*

**Elastic Scattering**
Deuteron D-wave and the non-eikonal effects in tensor asymmetries in elastic proton-deuteron scattering, 9:3740 (R;XA)

**PROTON-PROTON INTERACTIONS**
Hadronic heavy flavour production from the 2 → 3 QCD subprocess, 9:3754 (R;SU)

**Correlations**
Energy dependence of spin-spin correlation parameters in large-angle pp scattering, 9:3752 (R;SU;In Russian)

**Inclusive Interactions**
Polarization as a tool for studying the physics of weak interactions, 9:3733 (RA;XC)

**Jet Model**
Hard scattering and jet physics in connection with real photons, 9:3617 (RA;XC)

**Leading Particles**
Large missing-mass clusters in hydrodynamical approach, 9:3622 (R;BR)

**Missing Mass**
Large missing-mass clusters in hydrodynamical approach, 9:3622 (R;BR)

**Particle Production**
Production of pions, kaons, and muons by 16-GeV protons, 9:3768 (R;US)
Search for events having six quarks in the final state, 9:3627 (R;SU;In Russian)

**Scattering Amplitudes**
Energy dependence of spin-spin correlation parameters in large-angle pp scattering, 9:3752 (R;SU;In Russian)
Large-angle hadron scattering at high energies, 9:3761 (RA;SU;In Russian)

**Total Cross Sections**
Comparative study of the NN$\pi$ system, II. Elastic NN scattering, 9:3774 (R;IL)
New ISR and collider anti p-p and p-p data and asymptotic theorems, 9:3626 (R;FR)

**PROTONS**
*See also SOLAR PROTONS*

**Angular Distribution**
Simple method of energy and emission angle determination of protons registeres in heavy liquid bubble chambers, 9:3183 (R;SU;In Russian)

**Lifetime**
Practically stable proton in the SU-5 model, 9:3811 (RA;SU;In Russian)

**Particle Decay**
Quark-lepton unification and proton decay, 9:3792 (R;XA)

**Unified Gauge Models**
Practically stable proton in the SU-5 model, 9:3811 (RA;SU;In Russian)

**PROTOPLASTS**
*See PLANT CELLS*

**PROTOTYPE FAST REACTOR DOUNREAY**
*See PFR REACTOR*

**PSEUDOPARTICLES**
*See INSTANTONS*

**PSI RESONANCES**
*See also PSI-3105 RESONANCES*
*PSI-3695 RESONANCES*

**Radiative Decay**
Study of the decay J/psi→$\gamma$eta$\pi\pi$, 9:3722 (J;US)

**PSI-3105 RESONANCES**

**Hadronic Particle Decay**
First results from MARK III at SPEAR. MARK III collaboration, 9:3709 (R;US)
Measurement of psi(3097) and psi'(3686) decays into selected hadronic modes, 9:3720 (J;US)

**Radiative Decay**
First results from MARK III at SPEAR. MARK III collaboration, 9:3709 (R;US)

**PSI-3695 RESONANCES**

**Hadronic Particle Decay**
Measurement of psi(3097) and psi'(3686) decays into selected hadronic modes, 9:3720 (J;US)

**PTFE**
*See POLYTETRAFLUOROETHYLENE*

**PUBLIC BUILDINGS**

**Ventilation Systems**
Energy conservation of ventilation in commercial and public buildings. Basis. Method file, 9:2612 (R;FI;In Finnish)

**PUBLIC UTILITIES**
*See also ELECTRIC UTILITIES*
*GAS UTILITIES*

**Decision Making**
Roadmap for complex decisions, 9:4238 (J;US)

**Management**
Roadmap for complex decisions, 9:4238 (J;US)

**Regulations**
Consumer-related energy activities in Illinois. Final report, October 1, 1977-December 31, 1981, 9:2564 (R;US)

**PUBLIC UTILITY REGULATORY POLICIES ACT**
Applicability of ratemaking and lifeline-rate standards of PURPA, 9:2565 (R;US)

**PULMONARY CANCER**
*See CARCINOMAS*

**PULMONARY LAVAGE**
*See LUNGS*

**PULSARS**

**Synchrotron Radiation**
Pair production near threshold in pulsar magnetic fields, 9:3462 (R;US)

**PULSE DISCRIMINATORS**

**Li-Drifted Ge Detectors**
Use of the rise time discriminator for the improvement of the Ge(Li)-detector parameters, 9:3184 (R;SU;In Russian)

**PULSED FUSION REACTORS**

**Breeding Blankets**
Calculation of temperature fields in the pulsed fusion reactor blanket elements, 9:4156 (R;SU;In Russian)

**PULVERIZED FUEL ASH**
*See FLY ASH*

**PUMPS**
*See also WATER PUMPS*

**Uses**
Pumps-as-turbines experience profile, 9:2186 (R;US)

**PUREX PROCESS**
Chemical processing monthly report, 9:1931 (R;US)

**PURITY**
*See IMPURITIES*

**PURPA**
*See PUBLIC UTILITY REGULATORY POLICIES ACT*

**PWR TYPE REACTORS**
*See also ARKANSAS-1 REACTOR*
*ARKANSAS-2 REACTOR*
*RHEINSBERG AKW1 REACTOR*
*THREE MILE ISLAND-1 REACTOR*
*THREE MILE ISLAND-2 REACTOR*

**Accidents**
Study on the design basis accident 'aircraft impact on nuclear power plant', 9:2410 (R;DE;In German)

**After-Heat Removal**
Workshop on safety analysis reports and licensing procedures. Pt. 1 A, 9:2223 (R;DE)

**Air Cleaning Systems**
Aspects of retention of airborne $^{131}$I in light water reactors during normal operation, 9:2201 (RA;XA)
Need for revising US Nuclear Regulatory Commission Regulatory Guide 1.52 in light of NRC-sponsored research program results and other developments, 9:2200 (RA;XA)

**ATWS**
Analysis of results from a loss-of-offsite-power-initiated ATWS experiment in the LOFT facility, 9:2405 (R;US)
Experiment analysis and summary report for LOFT ATWS experiments L9-3 and L9-4, 9:2439 (R;US)
Results and analysis of a loss-of-feedwater induced ATWS experiment in the LOFT facility, 9:2402 (R;US)

**Auxiliary Water Systems**
Auxiliary systems, 9:2220 (R;DE)

**Biological Shields**
American National Standard: program for testing radiation shields in light-water reactors (LWR), 9:2506 (B;US)

**Containment Buildings**
High pressure melt ejection, 9:2449 (R;US)

Study on the design basis accident 'aircraft impact on nuclear power plant', 9:2410 (R;DE;In German)

**Containment Systems**
American National Standard: containment-system leakage-testing requirements, 9:2211 (B;US)

**Coolant Cleanup Systems**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)

**Core Catchers**
System study on the development of a core catcher concept for light water reactors. Final report/main volume, 9:2429 (R;DE;In German)
Systems study for development of a core catcher for LWR-type reactors. Final report/materials, 9:2411 (R;DE;In German)

**Electrical Equipment**
Relationship of fire protection research to plant safety, 9:2452 (R;US)

**Failure Mode Analysis**
Interim results of the accident sequence evaluation program (ASEP), 9:2451 (R;US)

**Fission Product Release**
Aspects of retention of airborne $^{131}I$ in light water reactors during normal operation, 9:2201 (RA;XA)

**Fuel Assemblies**
Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2216 (R;US)
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)
Fuel designs for light water reactors, 9:2228 (J;US)
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2443 (R;US)
Reliability breeds standardization in Combustion Engineering's fuel design, 9:2227 (J;US)

**Fuel Cans**
Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding, 9:2745 (J;US)

**Fuel Pellets**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)

**Fuel Pins**
Fabrication, irradiation and post-irradiation examinations of $MO_2$ and $UO_2$ sphere-pac and $UO_2$ pellet fuel pins irradiated in a PWR loop, 9:2218 (R;XE)
Real-time nonlinear estimation of fuel-clad gap conductance, 9:2335 (J;US)

**Fuel Pools**
Low-density moderation in PWR fuel storage, 9:2233 (J;US)

**Fuel Racks**
Low-density moderation in PWR fuel storage, 9:2233 (J;US)

**Fuel Rods**
High-reliability PWR fuel, 9:2226 (J;US)
Severe fuel-damage scoping test performance, 9:2399 (R;US)

**Gaseous Wastes**
Conception principles for insuring an efficient iodine trapping function on the 1300 MWe light water reactor ventilation system, 9:2203 (RA;XA;In French)

**HPCI**
Feasibility study on feed and bleed for pressurized-water reactors, 9:2403 (R;US)

**Ice Condensers**
Ice-condenser containment loadings during severe accidents, 9:2445 (R;US)

**Loss of Coolant**
An assessment of the radiological consequences of postulated reactor accidents, 9:2480 (J;US)
Best estimate analysis of LOFT L3-6/L8-1 by RELAP4/MOD6/U4/J3, 9:2433 (R;JP)
Experience reprogramming TRAC for the HEP computer, 9:2460 (J;US)
LOCA rupture strains and coolability of full-length PWR fuel bundles, 9:2443 (R;US)
PWR small-break analysis using a PDP-11/AD-10 computer system, 9:2459 (J;US)
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)
SCTF Core-I test results. System pressure effects on reflooding phenomena, 9:2432 (R;JP)
Summary results of the LOCA Simulation Program conducted in NRU, 9:2444 (R;US)

**Meltdown**
Core melt/coolant interactions: modelling, 9:2447 (R;US)
Core melt/coolant interactions: experiments, 9:2446 (R;US)
High pressure melt ejection, 9:2449 (R;US)
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)

**Pipelines**
Reliability analysis for stiff versus flexible piping, 9:2206 (R;US)

**Plutonium Recycle**
Program of neutronic experiments for the qualification of calculation methods applied to reactor cores reloaded with U-Pu mixed fuels: synthesis report, 9:2196 (R;XE;In French)
Synthesis report of a reactor-physics programme devoted to the qualification of the project calculation methods applied to the mixed (U-Pu) fuelled reloadings, 9:2197 (R;XE)

**Power Distribution**
Power distribution and fuel depletion calculation for a PWR, using LEOPARD and CITATION codes, 9:2235 (B;BR;In Portuguese)

**Power-Cooling-Mismatch Accidents**
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)

**Pressure Vessels**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
High pressure melt ejection, 9:2449 (R;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)

**Pressurizers**
Model to simulate the dynamic of a PWR pressurizer using the CSMP program, 9:2236 (B;BR;In Portuguese)

**Primary Coolant Circuits**
Layout of the components: Primary system components (class I), 9:2416 (R;DE)
Reduction of numerical diffusion errors in thermal mixing predictions, 9:2232 (J;US)
The design, construction, and operation of a working PWR primary loop simulator, 9:2225 (J;US)

**Quality Assurance**
Quality assurance activities of PWR plants in Japan, 9:2234 (J;US)

**Radioactive Waste Processing**
American National Standard: liquid radioactive-waste-processing system for light-water-reactor plants, 9:2345 (B;US)

**Reactor Accidents**
Ice-condenser containment loadings during severe accidents, 9:2445 (R;US)
Interim results of the accident sequence evaluation program (ASEP), 9:2451 (R;US)
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)
SARRP: risk rebaselining and risk reduction analysis, 9:2448 (R;US)
Severe fuel-damage scoping test performance, 9:2399 (R;US)

**Reactor Cooling Systems**
American National Standard: overpressure protection of low-pressure systems connected to the reactor-coolant pressure boundary, 9:2214 (B;US)
Cooling systems, emergency cooling, recooling, 9:2412 (R;DE)
**Reactor Core Disruption**
Comparisons of the SCDAP computer code with bundle data under severe accident conditions, 9:2404 (R;US)
**Reactor Cores**
Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2216 (R;US)
**Reactor Maintenance**
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
Procedures for maintenance and repairs, 9:2222 (R;DE)
**Reactor Materials**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water, 9:2215 (R;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Reactor Operation**
Dynamics of a nuclear power plant. Behaviour of PWR plants in normal and upset operation, 9:2415 (R;DE)
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2438 (R;US)
**Reactor Safety**
Dynamics of a nuclear power plant. Behaviour of PWR plants during malfunctions and accidents, 9:2414 (R;DE)
Layout of the components: Primary system components (class I), 9:2416 (R;DE)
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
PWR and BWR safety systems layout, 9:2413 (R;DE)
Relationship of fire protection research to plant safety, 9:2452 (R;US)
**Reliability**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)
**Risk Assessment**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)
**Secondary Coolant Circuits**
Secondary systems of PWR and BWR, 9:2204 (R;DE)
**Standards**
Quality assurance activities of PWR plants in Japan, 9:2234 (J;US)
**Steam Generators**
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water, 9:2215 (R;US)
**Testing**
Safety and licensing issues that are being addressed by the Power Burst Facility test programs, 9:2510 (BA;FI)
**Transients**
Review and analysis of insights from plant transients gained from the Interim Reliability Evaluation Program, 9:2450 (R;US)
**Ventilation**
Workshop on safety analysis reports and licensing procedures. Pt. 1 A, 9:2223 (R;DE)
**Water Chemistry**
Chemical operating experience in several European pressurized water reactor plants, 9:2224 (R;DE)
Water systems, 9:2221 (R;DE)

**PYRAZINES**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**PYRENE**
**Diffusion**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)
**Dynamics**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)
**Excitation**
Interplay between geometry and mobility in intramicellar kinetics, 9:2993 (J;DE)
**PYRIDINE**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**PYRIDINES**
*See also ACRIDINES*
*BIPYRIDINES*
*PICOLINES*
*PYRIDINE*
*QUINOLINES*
**Chemical Radiation Effects**
Synthesis and ion exchange properties of grafted poly(p-phenylene terephthalamide) (Gamma rays), 9:1914 (B;ZA)
**PYRITE**
**Oxidation**
Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82, 9:1803 (R;US)
**Weathering**
Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82, 9:1803 (R;US)
**PYRITES**
*See PYRITE*
**PYROLYSIS**
**Chemical Reactors**
Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2072 (R;NO;In Norwegian)
**Reaction Kinetics**
Importance of catalysis and carbon active sites in lignite char gasification, 9:1779 (D;US)
**PZT**
**Mechanical Properties**
Effect of surface treatments on strength of PZT polycrystalline ceramics, 9:2800 (J;GB)

## Q

**QUADRUPOLE LINACS**
**Stabilization**
Vane coupling rings: a simple technique for stabilizing a four-vane radiofrequency quadrupole structure, 9:3125 (J;US)
**QUADRUPOLES**
**Construction**
Fermilab tevatron quadrupoles, 9:3123 (J;US)
**Design**
Fermilab tevatron quadrupoles, 9:3123 (J;US)

**Performance Testing**
Fermilab tevatron quadrupoles, 9:3123 (J;US)
**QUALITY ASSURANCE**
**Planning**
Draft issue of proposed document entitled Management Program to Assure Quality, 9:4234 (R;US)
**QUANTITATIVE CHEMICAL ANALYSIS**
**Nuclear Magnetic Resonance**
Quantitative determination of hydrogen by pulsed nuclear magnetic resonance spectroscopy, 9:2895 (R;US)
**QUANTUM CHROMODYNAMICS**
Quantum chromodynamics in few-nucleon systems, 9:3773 (R;US)
**CP Invariance**
CP invariance problem in the quantum chromodynamics, 9:3758 (RA;SU;In Russian)
**Eigenvalues**
Eigenvalue problem in the QCD simulating theory, 9:3751 (R;SU)
**Factorization**
Factorization and other novel effects in QCD, 9:3772 (R;US)
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3771 (R;US)
**Fermions**
Link fermions and dynamically correlated paths for lattice gauge theory, 9:3847 (J;NL)
Surface description of QCD with fermionic quark boundaries, 9:3837 (R;IL)
**Hadron-Hadron Interactions**
Hadron physics at the SPS: Theoretical remarks, 9:3611 (RA;XC)
**Higgs Bosons**
Do light colored scalars exist?, 9:3848 (J;US)
**Mass Difference**
Critical analysis of the electromagnetic mass shift problem in QCD, 9:3741 (R;XA)
**Nuclear Matter**
States of matter in QCD, 9:3937 (RA;XC)
**P Invariance**
CP invariance problem in the quantum chromodynamics, 9:3758 (RA;SU;In Russian)
**Quarks**
Surface description of QCD with fermionic quark boundaries, 9:3837 (R;IL)
**Renormalization**
Problems at the interface between perturbative and nonperturbative quantum chromodynamics, 9:3771 (R;US)
**Research Programs**
Hadron physics at the SPS: Theoretical remarks, 9:3611 (RA;XC)
**Solitons**
Baryons as chiral solitons, 9:3816 (J;US)
**Supersymmetry**
Supersymmetry breaking by instantons, 9:3815 (J;US)
**Symmetry Breaking**
Do light colored scalars exist?, 9:3848 (J;US)
Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics, 9:3817 (J;US)
**QUANTUM ELECTRODYNAMICS**
*See also SCHWINGER-TOMONAGA FORMALISM*
Present state of quantum electrodynamics, 9:3830 (RA;SU;In Russian)
**Axial-Vector Currents**
New solution for the Schwinger model, 9:3822 (R;XA)
**QUANTUM FIELD THEORY**
*See also LATTICE FIELD THEORY*
*PHI4-FIELD THEORY*
*QUANTUM CHROMODYNAMICS*
*QUANTUM ELECTRODYNAMICS*
*QUANTUM FLAVORDYNAMICS*
**Algorithms**
Symbolic evaluation of some multidimensional integrals by the computer algebraic manipulations, 9:4013 (R;SU;In Russian)
**Graded Lie Groups**
Supergroup extensions: from central charges to quantization through relativistic wave equations, 9:3823 (R;XA)
**Integrals**
Symbolic evaluation of some multidimensional integrals by the computer algebraic manipulations, 9:4013 (R;SU;In Russian)
**Parastatistics**
Symmetry and symmetry breaking in generalized parastatistics, 9:3846 (J;US)
**Spinor Fields**
Eight-fold way to colour geometrodynamics, 9:3791 (R;XA)
**Symmetry Breaking**
Symmetry and symmetry breaking in generalized parastatistics, 9:3846 (J;US)
**QUANTUM FLAVORDYNAMICS**
**Symmetry Breaking**
Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics, 9:3817 (J;US)
**QUANTUM MECHANICS**
**Many-Body Problem**
Quantum collision theory with phase-space distribution functions, 9:4027 (J;US)
**Potential Scattering**
Quantum collision theory with phase-space distribution functions, 9:4027 (J;US)
**Schwinger Variational Method**
Schwinger variational method for the Bloch equation, 9:4025 (J;US)
**QUANTUM OPERATORS**
**Heisenberg Picture**
Heisenberg operators of generalized Toda lattice, 9:4002 (R;SU)
**QUARK CONFINEMENT**
*See BAG MODEL*
**QUARK MATERIAL**
*See QUARK MATTER*
**QUARK MATTER**
Collective, stochastic and nonequilibrium behavior of highly excited hadronic matter, 9:3770 (R;US)
**QUARK MODEL**
*See also BAG MODEL*
*FLAVOR MODEL*
*STRING MODELS*
Nonlocal quark model, 9:3809 (RA;SU;In Russian)
**QUARK PLASMA**
*See QUARK MATTER*
**QUARK SEA**
*See QUARK MATTER*
**QUARK-ANTIQUARK INTERACTIONS**
**Feynman Diagram**
One method to calculate of color factors of Feynman diagrams, 9:3806 (R;SU;In Russian)
**QUARK-GLUON PLASMA**
*See QUARK MATTER*
**QUARK-HADRON INTERACTIONS**
**Quark Model**
Nonlocal quark model, 9:3809 (RA;SU;In Russian)
**QUARKONIUM**
*A hypothetical bound state of quark and antiquark.*
*See also CHARMONIUM*
**Energy Levels**
Comment on "quark confinement and the Dirac equation", 9:3841 (J;US)
**QUARK-QUARK INTERACTIONS**
**Feynman Diagram**
One method to calculate of color factors of Feynman diagrams, 9:3806 (R;SU;In Russian)
**QUARKS**
**Composite Models**
Complex Rishon-type unification, 9:3835 (R;IL)
Composite model for quarks and leptons, 9:3836 (R;IL)
Quark mixing matrix in a composite model, 9:3782 (J;US)
**Configuration Mixing**
Quark mixing in weak interactions, 9:3788 (J;NL)
**Detection**
Quark search at the CBA, 9:3610 (R;US)
**Lifetime**
Lifetime of particles containing b quarks, 9:3717 (J;US)

**Mass**
Note in the msub(quark) dependence of <q-barq> from chiral perturbation theory, 9:3750 (R;XA)
T quark mass in the SO-(10) symmetry, 9:3810 (RA;SU;In Russian)
**Mass Difference**
Critical analysis of the electromagnetic mass shift problem in QCD, 9:3741 (R;XA)
**Matrix Elements**
Quark mixing matrix in a composite model, 9:3782 (J;US)
**Particle Identification**
Search for fractional charges in water, 9:3724 (J;US)
**Perturbation Theory**
Note in the msub(quark) dependence of <q-barq> from chiral perturbation theory, 9:3750 (R;XA)
**Quantum Field Theory**
Are lepton and quark families quantized dynamical systems, 9:3742 (R;XA)
**Selection Rules**
Glueballs multiquark states and the OZI rules, 9:3775 (R;IL)
**SO-10 Groups**
T quark mass in the SO-(10) symmetry, 9:3810 (RA;SU;In Russian)
**Unified Gauge Models**
Quark-lepton unification and proton decay, 9:3792 (R;XA)
**Weak Particle Decay**
Quark flavor identification in electron-positron annihilation, 9:3707 (R;US)

**QUARTZ**
**Acoustic ESR**
Multipulse sequences in electron-spin echoes, 9:3215 (J;US)
**Crystal Structure**
Ab initio calculation of interatomic force constants in $H_6Si_2O_7$ and the bulk modulus of $\alpha$ quartz and $\alpha$ cristobalite, 9:2880 (J;DE)
**Interatomic Forces**
Ab initio calculation of interatomic force constants in $H_6Si_2O_7$ and the bulk modulus of $\alpha$ quartz and $\alpha$ cristobalite, 9:2880 (J;DE)
**Luminescence**
Shock-induced luminescence from X-cut quartz and Z-cut lithium niobate, 9:2827 (R;US)
**Physical Radiation Effects**
Modification of point defects in quartz for device applications, 9:2829 (R;US)

**QUASIPARTICLE-PHONON MODEL**
Do spin and charge- exchange resonances possess a R(4)-symmetry, 9:3939 (R;BR)

**QUINOLINES**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

## R

**R PROCESS**
**Neutron Reactions**
Neutron capture rates in the r-process: the role of direct radiative capture[1], 9:3479 (J;US)

**R REACTOR**
**Thermal Pollution**
Thermal-effects study, 9:2342 (R;US)

**R-A REACTOR**
**Contamination**
Airborne radioactivities in the gas cooling and ventilation systems of the research reactor RA-Vinca, 9:2378 (RA;XA)

**RA-3 REACTOR**
**Fuel Elements**
LEU fuel development activities in Argentina, 9:2360 (RA;US)
Status of RA3 conversion studies, 9:2371 (RA;US)

**RABBITS**
**Contamination**
Black-tailed jack rabbit movements and habitat utilization at the Idaho National Engineering Laboratory radioactive waste management complex, 9:3295 (RA;US)
**Diet**
Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3315 (RA;US)
Relationships of black-tailed jack rabbit diets to vegetal composition of habitats, 9:3312 (RA;US)
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3279 (RA;US)
**Ecology**
Sage grouse, pronghorn, and lagomorph use of a sagebrush-grassland burn site on the Idaho National Engineering Laboratory, 9:3309 (RA;US)
**Environmental Effects**
Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3315 (RA;US)
**Population Density**
Relationships of black-tailed jack rabbit diets to vegetal composition of habitats, 9:3312 (RA;US)
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)
**Population Dynamics**
Impacts of jack rabbit herbivory on sagebrush steppe vegetation, 9:3315 (RA;US)
**Predator-Prey Interactions**
Raptor studies on the Idaho National Engineering Laboratory (Asio otus, Aquila chrysaetos, Haliaeetus leucocephalus), 9:3318 (RA;US)
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)
**Radiation Doses**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)

**RADIATION ACCIDENTS**
**Emergency Plans**
Technical bases for offsite emergency planning at SRP, 9:2401 (R;US)

**RADIATION BURDEN**
*See RADIATION DOSES*

**RADIATION DETECTORS**
*See also CORONA COUNTERS*
*DIELECTRIC TRACK DETECTORS*
*GAS TRACK DETECTORS*
*RADIOMETERS*
*SEMICONDUCTOR DETECTORS*
*SHOWER COUNTERS*
**Design**
Ion cyclotron resonance bridge detector for frequency sweep, 9:3211 (J;US)
**Fabrication**
Ion cyclotron resonance bridge detector for frequency sweep, 9:3211 (J;US)

**RADIATION DOSES**
**Mathematical Models**
ATR code improvements. Final report 15 Oct-31 Dec 79, 9:3272 (R;US)

**RADIATION EXPOSURE (DOSES)**
*See RADIATION DOSES*

**RADIATION HYGIENE**
*See RADIATION PROTECTION*

**RADIATION PROTECTION**
**International Agreements**
International regulations for radiation protection, 9:1958 (R;DE)
**Technology Transfer**
Radiation protection technology transfer for overseas nuclear power stations, 9:2468 (J;US)

**Training**
Training of health physics services staff at the Sellafield Works of British Nuclear Fuels, 9:2047 (RA;CA)

**RADIATION PROTECTION LAWS**
26183 - Royal Decree 2519/1982 of 12 August approving the Regulations on Protection Against Ionizing Radiation (Spain), 9:4263 (R;ES;In Spanish)
Radiation Protection and Control Act 1982. No. 49 of 1982 (Australia), 9:4259 (R;AU)
Radiation Safety Act 1975 - No. 44 of 1975 (Australia), 9:4260 (R;AU)
Radiation (Safety Control) Ordinance 1978 (Australia), 9:4261 (R;AU)
Stb No. 501 - Decree of 24 June 1981 to amend the Radioactive Materials Decree made under the Nuclear Energy Act (Netherlands), 9:4266 (R;NL;In Dutch)
Stb No. 502 - Decree of 24 June 1981 to amend the Devices Decree made under the Nuclear Energy Act (Netherlands), 9:4267 (R;NL;In Dutch)

**RADIATION SAFETY**
*See RADIATION PROTECTION*

**RADIATION SOURCE IMPLANTS**
**Gamma Detection**
Source localization with semiconductor detector in the intracavitary therapy, 9:3373 (RA;HU;In Hungarian, English)
**Tissue Distribution**
Source localization with semiconductor detector in the intracavitary therapy, 9:3373 (RA;HU;In Hungarian, English)

**RADIATION SOURCES**
*For cosmic sources of radiation see also COSMIC GAMMA SOURCES, COSMIC RADIO SOURCES, and COSMIC X-RAY SOURCES.*
*See also GAMMA SOURCES*
*RADIATION SOURCE IMPLANTS*
**Monitoring**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Permit Applications**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Regulations**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)
**Safety**
H-Coal Pilot Plant: radiation safety (with separate proprietary appendix). Rev., 9:1754 (R;US)

**RADICALS**
*Not to be used for compound descriptions.*
*See also HYDROXYL RADICALS*
*SUPEROXIDE RADICALS*
**Absorption Spectra**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)
**Acoustic ESR**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)
**Mass Spectroscopy**
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, October 15, 1982-January 14, 1983, 9:2121 (R;US)
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, July 15, 1982-October 14, 1982, 9:2120 (R;US)
**Matrix Isolation**
Optical absorption, electron spin resonance, and electron spin echo studies of the photoionization of tetramethylbenzidine in cationic and anionic synthetic vesicles: comparison with analogous micellar systems, 9:3012 (J;US)

**RADIOACTIVE AEROSOLS**
**Inhalation**
Solutions for the ICRP gastrointestinal activity from inhaled radioactive aerosols (Man), 9:3400 (J;US)

**RADIOACTIVE BIOLOGICAL WASTES**
*See RADIOACTIVE WASTES*

**RADIOACTIVE EFFLUENTS**
**Decontamination**
Demister apparatus for gaseous wastes carrying radioactive aerosols, 9:1952 (RA;XA;In French)
**Waste Management**
Experiences in radioactive gaseous effluent management in JAERI, 9:2379 (RA;XA)

**RADIOACTIVE GASEOUS WASTES**
*See GASEOUS WASTES*
*RADIOACTIVE WASTES*

**RADIOACTIVE MATERIALS**
*See also FISSION PRODUCTS*
*RADIOACTIVE WASTES*
**Accidents**
Regulation versus reality, 9:1938 (R;US)
**Laws**
Decree of 25 September 1982 amending Ministerial Decree of 27 July 1966 on conditions for notifying possession of radioactive materials and for annual updating of records thereof, 9:2054 (R;IT;In Italian)
Order of 9 November 1981 on exemptions from the Radioactive Substances Act, 9:2052 (R;DK;In Danish)
**Transport**
Radioactive Ores and Concentrates (Packaging and Transport) Act 1980. No. 26 of 1980, 9:1937 (R;AU)
**Transport Regulations**
Report of consultants to the IAEA on requirements for the safe transport of low hazard radioactive materials, 9:1923 (R;DE)

**RADIOACTIVE PARTICULATES**
*See RADIOACTIVE AEROSOLS*

**RADIOACTIVE TRACERS**
*See RADIOPHARMACEUTICALS*
*TRACER TECHNIQUES*

**RADIOACTIVE WASTE DISPOSAL**
**Alpha-Bearing Wastes**
A technology implementation perspective on defense transuranic waste management, 9:2028 (J;US)
Policy directions: Department of Energy transuranic waste management programs, 9:2027 (J;US)
Some chemical issues involved in the management and disposal of TRU wastes, 9:2029 (J;US)
The certification program of transuranic wastes at INEL, 9:2032 (J;US)
Transuranic waste management: technology status and needs, 9:2031 (J;US)
WIPP: the solution to disposal of defense transuranic waste, 9:2030 (J;US)
**Backfilling**
Mass transport from a waste emplaced in backfill and rock, 9:2017 (J;US)
**Comparative Evaluations**
Low-level waste disposal technology, 9:2011 (J;US)
**Computerized Simulation**
A systems modeling approach to evaluating low-level waste disposal systems, 9:2008 (J;US)
Use of the SYVAC computer code in assessing a nuclear fuel waste disposal concept, 9:1971 (RA;CA)
**Containers**
Design of containment for the long-term isolation of irradiated fuel during underground disposal, 9:1970 (RA;CA)
Waste packages for high-level waste repositories, 9:2014 (J;US)
**Coordinated Research Programs**
Scientific cooperation agreement on an investigation and surveillance programme on the site for radioactive waste disposal in the North-East Atlantic between the Nuclear Research Centre (CEN), Belgium and the National Laboratory of Industrial Engineering and Technology (LNETI), Portugal, 9:1985 (R;PT;In Portuguese)
**Cost**
Economics of low-level radioactive waste disposal, 9:1944 (R;US)
**Environmental Effects**
High-level waste disposal, 9:2013 (J;US)

Management of radwaste at Chalk River, Canada: storage and disposal, 9:2005 (J;US)
**Environmental Impacts**
A systems modeling approach to evaluating low-level waste disposal systems, 9:2008 (J;US)
Environmental effect of the barriers in the KBS disposal system, 9:2043 (RA;CA)
Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley, 9:2038 (J;US)
Utilizing existing technology to improve environmental protection, 9:2015 (J;US)
WIPP: the solution to disposal of defense transuranic waste, 9:2030 (J;US)
**Ethics**
Protecting future generations, 9:1968 (RA;CA)
**Geologic Deposits**
Application of oil exploration techniques toward finding a nuclear waste repository site, 9:2040 (J;US)
Preparing to license deep disposal facilities. The international scene, 9:1975 (RA;CA)
Summary of the Basalt Waste Isolation Project, 9:2016 (J;US)
**Heat Transfer**
Peak high-level waste package temperature versus annular air gap width, 9:2024 (J;US)
**High-Level Radioactive Wastes**
Actinide transmutation with a $UF_6$ reactor, 9:2026 (J;US)
Application of oil exploration techniques toward finding a nuclear waste repository site, 9:2040 (J;US)
Development of CT techniques for integrity evaluation of vitrified solids, 9:2023 (J;US)
High-level radioactive waste disposal in the ocean floor: an introduction, 9:2036 (J;US)
High-level waste disposal, 9:2013 (J;US)
Leach testing of INEL waste forms in a gamma field, 9:2022 (J;US)
Pacing and logistics of high-level waste disposal, 9:2025 (J;US)
Peak high-level waste package temperature versus annular air gap width, 9:2024 (J;US)
Radioactive waste disposal in the sea and alternative methods of ultimate disposal, 9:1979 (R;DE)
Waste packages for high-level waste repositories, 9:2014 (J;US)
**Intermediate-Level Radioactive Wastes**
Strategy for the disposal of low- and intermediate-level radwastes in Canada, 9:1972 (RA;CA)
**International Cooperation**
Canada's contribution towards international consensus on nuclear fuel waste disposal, 9:1976 (RA;CA)
Disposal safety. Is consensus necessary, 9:2049 (RA;CA)
Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor, 9:1983 (R;FR)
**Liabilities**
Financial security and insurance for damage caused by use of the seabed for radioactive waste disposal, 9:1984 (R;FR;In French)
Sub-seabed burial of radioactive waste and liabilities, 9:1982 (R;FR;In French)
**Low-Level Radioactive Wastes**
A systems modeling approach to evaluating low-level waste disposal systems, 9:2008 (J;US)
Economics of low-level radioactive waste disposal, 9:1944 (R;US)
Identification of cost factors for the ocean disposal alternative for low-level radioactive waste, 9:1995 (R;US)
Low-level waste disposal technology, 9:2011 (J;US)
Management of radwaste at Chalk River, Canada: storage and disposal, 9:2005 (J;US)
Potential low-level waste disposal limits for fusion radionuclides, 9:2060 (R;US)
Radioactive waste disposal in the sea and alternative methods of ultimate disposal, 9:1979 (R;DE)
Radwaste characterization: key to an optimized waste management plan, 9:2007 (J;US)
Selecting host states for low-level waste-disposal sites, 9:1943 (R;US)
States' approach to low-level waste disposal, 9:2010 (J;US)
Strategy for the disposal of low- and intermediate-level radwastes in Canada, 9:1972 (RA;CA)
Survey of power plant LLW volume reduction and storage actions/plans, 9:2004 (J;US)
Utilizing existing technology to improve environmental protection, 9:2015 (J;US)
**Marine Disposal**
Financial security and insurance for damage caused by use of the seabed for radioactive waste disposal, 9:1984 (R;FR;In French)
High-level radioactive waste disposal in the ocean floor: an introduction, 9:2036 (J;US)
Identification of cost factors for the ocean disposal alternative for low-level radioactive waste, 9:1995 (R;US)
Radioactive waste disposal in the sea and alternative methods of ultimate disposal, 9:1979 (R;DE)
Scientific cooperation agreement on an investigation and surveillance programme on the site for radioactive waste disposal in the North-East Atlantic between the Nuclear Research Centre (CEN), Belgium and the National Laboratory of Industrial Engineering and Technology (LNETI), Portugal, 9:1985 (R;PT;In Portuguese)
**Mill Tailings**
Innovation required in the disposal of uranium mine wastes, 9:1969 (RA;CA)
**Packaging**
Waste packages for high-level waste repositories, 9:2014 (J;US)
**Pilot Plants**
WIPP: the solution to disposal of defense transuranic waste, 9:2030 (J;US)
**Planning**
Pacing and logistics of high-level waste disposal, 9:2025 (J;US)
**Program Management**
Regional low-level radioactive waste disposal sites: progress being made but new sites will probably not be ready by 1986, 9:2051 (R;US)
**Radionuclide Migration**
Effect of repository heating on dissolution of glass waste, 9:2019 (J;US)
Error analysis of nuclear waste migration, 9:2021 (J;US)
Mass transport from a waste emplaced in backfill and rock, 9:2017 (J;US)
Radionuclide migration in transport paths bounded by the environment, 9:2020 (J;US)
Solubility-limited transport of radionuclides through fractured rock, 9:2018 (J;US)
Summary of the Basalt Waste Isolation Project, 9:2016 (J;US)
**Research Programs**
Canada's contribution towards international consensus on nuclear fuel waste disposal, 9:1976 (RA;CA)
Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor, 9:1983 (R;FR)
**Risk Assessment**
Use of the SYVAC computer code in assessing a nuclear fuel waste disposal concept, 9:1971 (RA;CA)
**Safety**
Disposal safety. Is consensus necessary, 9:2049 (RA;CA)
Environmental effect of the barriers in the KBS disposal system, 9:2043 (RA;CA)
Safety assessment of fuel water disposal appropriate to the German waste management programme, 9:1974 (RA;CA)
**Salt Deposits**
Peak high-level waste package temperature versus annular air gap width, 9:2024 (J;US)
Site evaluation for disposal facilities in salt, 9:1978 (R;DE)
**Sea Bed**
Sub-seabed burial of radioactive waste and liabilities, 9:1982 (R;FR;In French)
Techniques and International Programs for Nuclear Waste Disposal Beneath the Ocean Floor, 9:1983 (R;FR)
**Site Selection**
Application of oil exploration techniques toward finding a nuclear waste repository site, 9:2040 (J;US)
Nuclear Regulatory Commission programs, 9:2440 (RA;US)

Regional low-level radioactive waste disposal sites: progress being made but new sites will probably not be ready by 1986, 9:2051 (R;US)
Selecting host states for low-level waste-disposal sites, 9:1943 (R;US)
Site evaluation for disposal facilities in salt, 9:1978 (R;DE)
**Site Surveys**
WIPP: the solution to disposal of defense transuranic waste, 9:2030 (J;US)
**Technology Assessment**
A systems modeling approach to evaluating low-level waste disposal systems, 9:2008 (J;US)
Low-level waste disposal technology, 9:2011 (J;US)
Pacing and logistics of high-level waste disposal, 9:2025 (J;US)
**Temperature Gradients**
Peak high-level waste package temperature versus annular air gap width, 9:2024 (J;US)
**Underground Disposal**
Error analysis of nuclear waste migration, 9:2021 (J;US)
R and D program concerning radioactive waste disposal in deep geologic formation (Study of an argilaceous formation in Belgium). Summary of works carried out in the years 1975-1979, 9:1947 (R;XE;In French)
Safety assessment of fuel water disposal appropriate to the German waste management programme, 9:1974 (RA;CA)
**Waste-Rock Interactions**
Mass transport from a waste emplaced in backfill and rock, 9:2017 (J;US)
Radionuclide migration in transport paths bounded by the environment, 9:2020 (J;US)

**RADIOACTIVE WASTE FACILITIES**
**Biological Shields**
Shield integrity examinations at the NWCF, 9:2048 (RA;CA)
**Design**
Summary of the Basalt Waste Isolation Project, 9:2016 (J;US)
**Environmental Effects**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)
**Personnel**
Projected occupational exposures during WIPP operations, 9:2002 (J;US)
**Radiation Protection**
Projected occupational exposures during WIPP operations, 9:2002 (J;US)
**Radioecology**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)
Ecology of carrion beetles (Nicrophorus spp.) at a solid radioactive waste disposal area, 9:3293 (RA;US)
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)
Population ecology of small mammals on the radioactive waste management complex, Idaho National Engineering Laboratory, 9:3290 (RA;US)
Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area, 9:1941 (RA;US)
Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area, 9:3294 (RA;US)
Small mammal density and movement on the SL-1 disposal area, Idaho National Engineering Laboratory, 9:3291 (RA;US)
**Radionuclide Migration**
Black-tailed jack rabbit movements and habitat utilization at the Idaho National Engineering Laboratory radioactive waste management complex, 9:3295 (RA;US)
**Research Programs**
Project progress report for month ending September 30, 1983, 9:2001 (R;US)
**Site Selection**
Public hearings panel report: a summary of public concerns regarding the characterization of a repository site in Nevada (Yucca Mountain), 9:1987 (R;US)

**RADIOACTIVE WASTE MANAGEMENT**
Simulated HLLW compositions for cold test of waste management development, 9:1986 (R;JP)
The effect of accidents on decommissioning waste management for nuclear fuel cycle and nonfuel cycle facilities, 9:2306 (J;US)
**Alpha-Bearing Wastes**
Policy directions: Department of Energy transuranic waste management programs, 9:2027 (J;US)
The certification program of transuranic wastes at INEL, 9:2032 (J;US)
Transuranic waste management: technology status and needs, 9:2031 (J;US)
**Government Policies**
Policy directions: Department of Energy transuranic waste management programs, 9:2027 (J;US)
**Low-Level Radioactive Wastes**
Concentrations of selected short-lived isotopes in a low-level waste inventory, 9:2009 (J;US)
Radwaste characterization: key to an optimized waste management plan, 9:2007 (J;US)
Regional compacting for low-level radioactive waste management: an innovative approach, 9:2003 (J;US)
States' approach to low-level waste disposal, 9:2010 (J;US)
Survey of power plant LLW volume reduction and storage actions/plans, 9:2004 (J;US)
**Meetings**
Waste management in nuclear facilities. Abstracts, 9:2041 (B;DE)
**Research Programs**
Nuclear waste management, 9:1993 (RA;US)
**Safeguard Regulations**
Transuranic waste management: technology status and needs, 9:2031 (J;US)
**Technology Assessment**
Transuranic waste management: technology status and needs, 9:2031 (J;US)
**Technology Transfer**
A technology implementation perspective on defense transuranic waste management, 9:2028 (J;US)
**Technology Utilization**
The U.S. DOE commercial waste disposal programs, 9:2037 (J;US)

**RADIOACTIVE WASTE PROCESSING**
*See also SYNROC PROCESS*
Ion exchange mechanism of cesium removal by cyanoferrates, 9:2042 (B;GB)
**Alpha-Bearing Wastes**
A technology implementation perspective on defense transuranic waste management, 9:2028 (J;US)
Commercial waste treatment technology and programs, 9:2012 (J;US)
Concreting of incinerated simulated TRU wastes, 9:2034 (J;US)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:1998 (R;US)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:1996 (R;US)
Status, direction, and critical issues of waste treatment technology, 9:1997 (R;US)
**Anaerobic Digestion**
Biotechnology and environmental programs, 9:3388 (RA;US)
**Carbon 14**
Nuclear waste management, 9:1993 (RA;US)
**Combustion**
Concreting of incinerated simulated TRU wastes, 9:2034 (J;US)
Design and operational experience with the off-gas cleaning system of the Seibersdorf incinerator plant, 9:1953 (RA;XA)
High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium, 9:1949 (R;XE)
Radwaste incineration at CRNL, 9:1965 (RA;CA)
Status, direction, and critical issues of waste treatment technology, 9:1997 (R;US)
Treatment of Pu-containing waste by acid digestion (wet combustion), 9:1977 (R;DE)

**Compacting**
Survey of power plant LLW volume reduction and storage actions/plans, 9:2004 (J;US)
**Electrochemistry**
Electrical processes for the treatment of medium-active liquid wastes. Annual progress report, January-December 1982, 9:1939 (R;GB)
**Encapsulation**
Processing of irradiated fuel cans by rolling and embedding in concrete (Final report Nov 1976-Jul 1980), 9:1950 (R;XE;In German)
**Financial Incentives**
Commercial waste treatment technology and programs, 9:2012 (J;US)
**Gaseous Wastes**
Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruhe, Germany, F.R., 3-7 May 1982, 9:1956 (R;XA)
**High-Level Radioactive Wastes**
Commercial waste treatment technology and programs, 9:2012 (J;US)
Development of a batch process for immobilizing some CRNL radioactive waste in glass, 9:1963 (RA;CA)
Nuclear waste management, 9:1993 (RA;US)
Status, direction, and critical issues of waste treatment technology, 9:1997 (R;US)
**Intermediate-Level Radioactive Wastes**
Bituminization of nuclear wastes. Development, design and demonstration, 9:1967 (RA;CA)
**Iodine 129**
Photochemical abatement of radioactive iodines, 9:1964 (RA;CA)
**Iodine 131**
Photochemical abatement of radioactive iodines, 9:1964 (RA;CA)
**Leaching**
Acid digestion of Pu-containing waste. Process development and Pu-recovery, 9:1945 (R;XE;In German)
**Liquid Wastes**
Treatment of radioactive liquid wastes at the Loviisa nuclear power station, Finland, 9:2006 (J;US)
**Low-Level Radioactive Wastes**
Bituminization of nuclear wastes. Development, design and demonstration, 9:1967 (RA;CA)
Commercial waste treatment technology and programs, 9:2012 (J;US)
Radwaste incineration at CRNL, 9:1965 (RA;CA)
Reverse osmosis plant to process CRNL low-level radioactive liquid wastes, 9:1966 (RA;CA)
Status, direction, and critical issues of waste treatment technology, 9:1997 (R;US)
Survey of power plant LLW volume reduction and storage actions/plans, 9:2004 (J;US)
Treatment of radioactive liquid wastes at the Loviisa nuclear power station, Finland, 9:2006 (J;US)
Utilizing existing technology to improve environmental protection, 9:2015 (J;US)
**Meetings**
Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruhe, Germany, F.R., 3-7 May 1982, 9:1956 (R;XA)
**Osmosis**
Reverse osmosis plant to process CRNL low-level radioactive liquid wastes, 9:1966 (RA;CA)
**Pilot Plants**
Development of a batch process for immobilizing some CRNL radioactive waste in glass, 9:1963 (RA;CA)
**Plutonium**
Treatment of Pu-containing waste by acid digestion (wet combustion), 9:1977 (R;DE)
**Radioactive Effluents**
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Solidification**
Bituminization of nuclear wastes. Development, design and demonstration, 9:1967 (RA;CA)
Concreting of incinerated simulated TRU wastes, 9:2034 (J;US)
Development of a batch process for immobilizing some CRNL radioactive waste in glass, 9:1963 (RA;CA)
Handling and storage of high-level liquid wastes from reprocessing of spent fuel, 9:1961 (R;DE)
Radiation damage in nuclear waste ceramics, 9:2788 (J;US)
Solidification of alpha-bearing wastes in ceramic, 9:1948 (R;XE;In German)
Treatment of concentrated waste for storage - fixation of concentrated gaseous waste, 9:1957 (R;DE)
Treatment of concentrated waste for storage and disposal, 9:1980 (R;DE)
Utilizing existing technology to improve environmental protection, 9:2015 (J;US)
**Standards**
American National Standard: liquid radioactive-waste-processing system for light-water-reactor plants, 9:2345 (B;US)
**Technology Assessment**
Commercial waste treatment technology and programs, 9:2012 (J;US)
**Vitrification**
Fabrication of high activity glasses in the cells VULCAIN and PIVER. Leaching at three temperatures of some of these glasses in the VULCAIN cell, 9:1946 (R;XE;In French)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:1998 (R;US)
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:1996 (R;US)
Status, direction, and critical issues of waste treatment technology, 9:1997 (R;US)

**RADIOACTIVE WASTE STORAGE**
**Coverings**
Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area, 9:1941 (RA;US)
**Leaks**
Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area, 9:1941 (RA;US)
**Liquid Wastes**
Treatment of radioactive liquid wastes at the Loviisa nuclear power station, Finland, 9:2006 (J;US)
**Low-Level Radioactive Wastes**
Application of conventional building technology in the storage of low level solid reactor wastes, 9:1973 (RA;CA)
Management of radwaste at Chalk River, Canada: storage and disposal, 9:2005 (J;US)

**RADIOACTIVE WASTES**
*See also ALPHA-BEARING WASTES*
*CALCINED WASTES*
*HIGH-LEVEL RADIOACTIVE WASTES*
*LOW-LEVEL RADIOACTIVE WASTES*
*RADIOACTIVE EFFLUENTS*
**Gas Analysis**
Isotope specific noble gas monitoring, 9:3174 (RA;CA)
**Gaseous Wastes**
Isotope specific noble gas monitoring, 9:3174 (RA;CA)
**Rare Gases**
Isotope specific noble gas monitoring, 9:3174 (RA;CA)

**RADIOAPPLICATORS**
*See RADIATION SOURCES*

**RADIOAUTOGRAPHY**
*See AUTORADIOGRAPHY*

**RADIOCARBON DATING**
*See CARBON 14*
*ISOTOPE DATING*

**RADIOCHEMICAL LABORATORIES**
*See HOT LABS*

**RADIOECOLOGICAL CONCENTRATION**
**Temperature Effects**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)

**RADIOECOLOGY**
**Reviews**
Radioecology: nuclear energy and the environment, 9:3300 (B;US)

**RADIOGRAPHS**
*See IMAGES*
**RADIOGRAPHY (AUTO)**
*See AUTORADIOGRAPHY*
**RADIOGRAPHY (BIOMEDICAL)**
*See BIOMEDICAL RADIOGRAPHY*
**RADIOISOTOPE GENERATORS**
**Fabrication**
Simple approach for single and double column fabrication for radionuclide generators, 9:3041 (J;GB)
**RADIOISOTOPE KINETICS**
*See RADIONUCLIDE KINETICS*
**RADIOISOTOPE MIGRATION**
*See RADIONUCLIDE MIGRATION*
**RADIOISOTOPE-LABELLED DRUGS**
*See RADIOPHARMACEUTICALS*
**RADIOISOTOPES**
*See also NEUTRON-DEFICIENT ISOTOPES*
*NEUTRON-RICH ISOTOPES*
**Environmental Exposure Pathway**
Examination of the environmental half-time for radionuclides deposited on vegetation, 9:3299 (J;GB)
**Half-Life**
Examination of the environmental half-time for radionuclides deposited on vegetation, 9:3299 (J;GB)
**Uses**
Radioisotope applications in industry. Part 2: Practical applications, 9:3189 (R;AT;In German)
**RADIOLOGICAL PERSONNEL**
**Radiation Protection**
ATR code improvements. Final report 15 Oct-31 Dec 79, 9:3272 (R;US)
**RADIOLOGICAL PROTECTION**
*See RADIATION PROTECTION*
**RADIOMETERS**
**Design**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**Fabrication**
Portable, fast-response gas sensor for measuring methane and ethane and propane in liquefied natural gas spills, 9:2900 (J;US)
**RADIOMETRIC GAGES**
Radioisotope applications in industry. Part 2: Practical applications, 9:3189 (R;AT;In German)
**Calibration**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**RADIONUCLIDE DISTRIBUTIONS**
*See RADIONUCLIDE KINETICS*
**RADIONUCLIDE KINETICS**
*For radionuclides in living organisms only; see also TRANSLOCATION.*
**Differential Equations**
Solutions for the ICRP gastrointestinal activity from inhaled radioactive aerosols (Man), 9:3400 (J;US)
**RADIONUCLIDE METABOLISM**
*See RADIONUCLIDE KINETICS*
**RADIONUCLIDE MIGRATION**
*In environment.*
**Data Covariances**
Error analysis of nuclear waste migration, 9:2021 (J;US)
**RADIONUCLIDE TRANSFER (IN ENVIRONMENT)**
*See RADIONUCLIDE MIGRATION*
**RADIONUCLIDE TRANSFER (IN ORGANISMS)**
*See RADIONUCLIDE KINETICS*
**RADIONUCLIDE TURNOVER**
*See RADIONUCLIDE KINETICS*
**RADIONUCLIDES**
*See RADIOISOTOPES*
**RADIOPHARMACEUTICALS**
**Chemical Preparation**
Preparation of carbon 11-labelled radiopharmaceuticals by the use of HPLC method, 9:3350 (R;FR;In French)
Syntheses of radiobrominated 2-deoxy-2-bromo-D-glucose and 2-deoxy-2-bromo-D mannose for the measurement of cerebral glucose metabolism in vivo, 9:3046 (J;GB)
Synthesis of radiobrominated 4-bromoantipyrine for the measurement of cerebral blood flow, 9:3043 (J;GB)
**RADIOPROTECTIVE SUBSTANCES**
*See also DTPA*
**Biological Effects**
Antiemetic studies both pre and post exposure: preliminary findings. Preliminary report Jan-Oct 82, 9:3385 (R;US)
**RADIORESISTANCE**
*See RADIOSENSITIVITY*
**RADIOSENSITIVITY**
**Genetic Control**
Relationship of DNA repair processes to mutagenesis and carcinogenesis in mammalian cells. Three-year report, February 1, 1981-September 30, 1983, 9:3386 (R;US)
**RADIOSURGERY**
*See RADIOTHERAPY*
**RADIOTHERAPY**
*See also AFTERLOADING*
*NEUTRON THERAPY*
**Electron Beams**
Electron beam therapy of breast carcinoma. Pt. 3. Early results, 9:3368 (RA;HU;In Hungarian, English)
**Irradiation Procedures**
Physical investigation on the postoperative chest wall irradiation with tangential cobalt moving beam, 9:3366 (RA;HU;In Hungarian, English)
Tangential moving (pendel) technique in postoperative irradiation of breast cancer, 9:3365 (RA;HU;In Hungarian, English)
**Planning**
Electron therapy of breast carcinoma. Pt. 1. Treatment planning, 9:3367 (RA;HU;In Hungarian, English)
Radiation therapy plan for Regional Health Planning Council, Newark, New Jersey, 1980. New Jersey Health Service Area 2, 9:3352 (R;US)
**Side Effects**
Review of three incidents involving the release of $^{125}$I from seeds interstitially implanted within the prostate gland, 9:3390 (J;GB)
**RADIOTHORIUM**
*See THORIUM 228*
**RADISHES**
**Contamination**
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
**RADIUM 218**
**Cluster Model**
Molecular alpha-particle clustering in $^{218}$Ra; dipole collectivity in the vicinity of nuclear shell closures, 9:3928 (J;US)
**Energy-Level Transitions**
Molecular alpha-particle clustering in $^{218}$Ra; dipole collectivity in the vicinity of nuclear shell closures, 9:3928 (J;US)
**RADIUM 225**
**Energy-Level Transitions**
Comment on "Determination of gamma-ray energies and abundances of $^{229}$Th", 9:3934 (J;US)
**RADIUM 226**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Excretion**
Radium retention in mature beagles injected at 5 years of age, 9:3398 (J;US)
**Radioecological Concentration**
Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area, 9:3333 (R;US)
**Retention**
Radium retention in mature beagles injected at 5 years of age, 9:3398 (J;US)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**RADIUM C**
*See BISMUTH 214*
**RADIUM D**
*See LEAD 210*
**RADIUM G**
*See LEAD 206*
**RADON 222**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Radioecological Concentration**
Study of radium-226 and radon-222 concentrations in ground water near a phosphate mining and manufacturing facility with emphasis on the hydrogeologic characteristics of the area, 9:3333 (R;US)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**RAFT RIVER VALLEY**
**Geothermal Power Plants**
Raft River 5MW(e) binary geothermal-electric power plant: operation and performance, 9:2163 (R;US)
**RALEIGH-NCSC RESEARCH REACTOR-1**
*See NCSCR-1 REACTOR*
**RAMAN EFFECT**
Theory of surface enhanced Raman scattering, 9:3583 (J;US)
**Solitons**
Observation of solitons in stimulated Raman scattering, 9:3558 (J;US)
**RARE EARTH COMPOUNDS**
*See also NEODYMIUM COMPOUNDS*
**Magnetic Properties**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**Specific Heat**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**Spin Waves**
Low-temperature heat capacity of antiferromagnetic ternary rare-earth iron silicides $M_2Fe_3Si_5$, 9:2855 (J;US)
**RARE GASES**
*See also ARGON*
*HELIUM*
*KRYPTON*
*NEON*
*XENON*
**Adsorption**
Physical adsorption and molecular dynamics, 9:2817 (RA;BR;In Spanish)
**Gas Analysis**
Isotope specific noble gas monitoring, 9:3174 (RA;CA)
**RASCHIG RINGS**
*See COLUMN PACKING*
**RATS**
**Behavior**
Influence of chronic exposure to low level pulsed microwave radiation on performance and cognitive behavior. Final report, 9:3424 (R;US)
**RDF**
*See REFUSE DERIVED FUELS*
**REACTIVITY WORTHS**
**Adjoint Flux**
Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'", 9:2324 (J;US)
**REACTOR ACCIDENTS**
*See also ATWS*
*FUEL ELEMENT FAILURE*
*LOSS OF COOLANT*
*MELTDOWN*
*POWER-COOLING-MISMATCH ACCIDENTS*
*REACTOR CORE DISRUPTION*
*TRANSIENT OVERPOWER ACCIDENTS*
**Computerized Simulation**
Development of a data base for quantification of accident sequences, 9:2489 (BA;US)
**Data Analysis**
Development of a data base for quantification of accident sequences, 9:2489 (BA;US)
**Data Processing**
Development of a data base for quantification of accident sequences, 9:2489 (BA;US)
**Emergency Plans**
Emergency plans for nuclear power accidents. Danish-Swedish exercise Oct 7th 1982, 9:2431 (R;SE;In Swedish)
**Failure Mode Analysis**
Accident sequence evaluation for IREP, 9:2496 (BA;US)
**Fault Tree Analysis**
Accident sequence evaluation for IREP, 9:2496 (BA;US)
**Fission Product Release**
Fission product behavior and containment response models for use in PRA studies, 9:2490 (BA;US)
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
**Health Hazards**
Effects of the accident at Three Mile Island on the mental health and behavioral responses of the general population and nuclear workers, 9:2455 (J;GB)
**Heat Flux**
Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2437 (R;US)
**Heat Transfer**
Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2437 (R;US)
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2400 (R;US)
**Hydraulics**
Assessment of the accident response of a light-water-moderated breeder-reactor system: AWBA development program, 9:2437 (R;US)
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)
Use of Kalman filter methods in analysis of in-pile LMFBR accident simulations, 9:2400 (R;US)
**Pressure Gradients**
Ice-condenser containment loadings during severe accidents (PWR; BWR), 9:2445 (R;US)
**Radiation Protection**
Three Mile Island 2. The accident of March 28, 1979, as seen from the point of view of radiation protection experts, 9:2428 (R;DE;In German)
**Risk Assessment**
Accident sequence evaluation for IREP, 9:2496 (BA;US)
Fission product behavior and containment response models for use in PRA studies, 9:2490 (BA;US)
Interim results of the accident sequence evaluation program (ASEP) (PWR; BWR), 9:2451 (R;US)
Realistic estimates of the consequences of nuclear accidents, 9:2424 (RA;CA)
SARRP: risk rebaselining and risk reduction analysis (PWR; BWR), 9:2448 (R;US)
**Temperature Gradients**
Ice-condenser containment loadings during severe accidents (PWR; BWR), 9:2445 (R;US)
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)
**Thermal Shock**
Reassessment of PWR pressure-vessel integrity during overcooling accidents, 9:2398 (R;US)
**Thermal Stresses**
Severe fuel-damage scoping test performance (PWR), 9:2399 (R;US)
**REACTOR ARGENTIN-3**
*See RA-3 REACTOR*
**REACTOR CELLS**
**Neutron Transport Theory**
Application of polynomial expansions for calculating neutron transport through spherical regions with cavities, 9:2318 (R;SU;In Russian)

**Thermal Neutrons**
Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core, 9:2319 (R;SU;In Russian)
**Thermalization**
Thermalization of neutrons in a heterogeneous cell of the molten salt reactor core, 9:2319 (R;SU;In Russian)
**REACTOR COMPONENTS**
*See also BREEDING BLANKETS*
*CONTROL ELEMENTS*
*CORE CATCHERS*
*FUEL ELEMENTS*
*REACTOR COOLING SYSTEMS*
*REACTOR CORES*
**Failure Mode Analysis**
Structures for common-cause failure analysis, 9:2500 (BA;US)
**Risk Assessment**
Structures for common-cause failure analysis, 9:2500 (BA;US)
**REACTOR CONTROL RODS**
*See CONTROL ELEMENTS*
**REACTOR CONTROL THEORY**
*See REACTOR KINETICS*
**REACTOR COOLING SYSTEMS**
*See also PRIMARY COOLANT CIRCUITS*
**Acoustic Emission Testing**
Development of acoustic leak detection in a primary cooling system, 9:3090 (RA;CA)
**Leak Testing**
Development of acoustic leak detection in a primary cooling system, 9:3090 (RA;CA)
**Potential Flow**
Method for determining the mass of stagnant liquid during an infinite rod fuel assembly flowing round, 9:2327 (R;SU;In Russian)
**Simulators**
Method for determining the mass of stagnant liquid during an infinite rod fuel assembly flowing round, 9:2327 (R;SU;In Russian)
**Standards**
American National Standard: overpressure protection of low-pressure systems connected to the reactor-coolant pressure boundary, 9:2214 (B;US)
**Systems Analysis**
System design considerations on the cooling system of the experimental multi-purpose very high temperature gas cooled reactor, 9:2245 (R;JP;In Japanese)
**REACTOR CORE DISRUPTION**
**Fission Product Release**
Preliminary analysis of fission gas behavior and oxide fuel response during an LMFBR operational transient, 9:2463 (J;US)
**Heat Transfer**
Comparisons of the SCDAP computer code with bundle data under severe accident conditions (PWR; BWR), 9:2404 (R;US)
**Hydraulics**
Comparisons of the SCDAP computer code with bundle data under severe accident conditions (PWR; BWR), 9:2404 (R;US)
**REACTOR CORE RESTRAINTS**
**Seismic Effects**
SONATINA-2V: a computer program for seismic analysis of the two-dimensional vertical slice HTGR core, 9:2244 (R;JP)
**REACTOR CORES**
**Critical Heat Flux**
Core subchannel thermal-hydraulic analysis methods and critical heat-flux margin in a light-water breeder reactor, 9:2281 (R;US)
**Multiplication Factors**
Averaging of constants in the $B^3$ approximation for reactor calculation, 9:2317 (R;SU;In Russian)
**Neutron Flux**
High order method in flux mapping, 9:2261 (RA;CA)
**Planning**
Core design with respect to the safety concept, 9:2430 (R;DE)
**Power Distribution**
Axial blanket fuel design and demonstration. Fourth progress report, April 1982-March 1983, 9:2216 (R;US)
**Seismic Effects**
Experimental and analytical seismic study on 600 MWe CANDU core, 9:2427 (RA;CA)
**REACTOR DECOMMISSIONING**
**Cost**
Preliminary nuclear decommissioning cost study, 9:2425 (RA;CA)
**Standards**
American National Standard: for decommissioning of research reactors, 9:2505 (B;US)
**REACTOR FUEL ELEMENTS**
*See FUEL ELEMENTS*
**REACTOR FUELING**
**Computerized Simulation**
Simulation of fuelling operations for CANDU-type reactors, 9:2260 (RA;CA)
**Pellet Injection**
Development of hydrogen pellet injectors and pellet fuelling experiments at Oak Ridge National Laboratory, 9:4224 (BA;XA)
**Remote Handling Equipment**
American National Standard: design requirements for light-water-reactor fuel-handling systems, 9:2212 (B;US)
**Standards**
American National Standard: design requirements for light-water-reactor fuel-handling systems, 9:2212 (B;US)
**REACTOR FUELS**
*See NUCLEAR FUELS*
**REACTOR KINETICS**
**Computerized Simulation**
Bimodal analysis and spatial control, 9:2321 (RA;CA)
**Multigroup Theory**
Solving the uncommon nuclear reactor core neutronics problems, 9:2325 (J;US)
**Neutron Diffusion Equation**
Subnoding technique in the context of the analytic nodal method, 9:2320 (RA;CA)
**Neutron Transport Theory**
Comparison of neutron transport calculations with NRC test results. Final report, 9:2322 (R;DE;In German)
Solving the uncommon nuclear reactor core neutronics problems, 9:2325 (J;US)
**REACTOR LICENSING**
**Brazilian CNEN**
Licensing of nuclear power plants in Brazil, 9:2299 (R;DE)
**IAEA**
IAEA code and safety guides on licensing, 9:2300 (R;DE)
**Lectures**
Safety philosophy and licensing practice in different member states of IAEA: Canada, 9:2297 (R;DE)
**Regulatory Guides**
IAEA code and safety guides on licensing, 9:2300 (R;DE)
**Standards**
American National Standard: criteria for technical specifications for nuclear power stations, 9:2509 (B;US)
**REACTOR MAINTENANCE**
Inspection and maintenance plans. In-service inspections, 9:2339 (R;DE)
**Technology Transfer**
A functional system definition for operations, testing, and training, 9:2470 (J;US)
Experience that contribute to operation and maintenance technology transfer, 9:2471 (J;US)
Experience in transfer of BWR maintenance technology, 9:2472 (J;US)
Maintenance experience in Spain, 9:2473 (J;US)
Nuclear customer services, 9:2469 (J;US)
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
**Technology Utilization**
Maintenance experience in Spain, 9:2473 (J;US)
**REACTOR MATERIALS**
***To be assigned in conjunction with the specific descriptor for the material used in a reactor, provided this descriptor is not yet up-posted to reactor materials.***
*See also NUCLEAR FUELS*

**Carburization**
Materials selection for advanced-HTGR component development, 9:2250 (J;US)
The kinetics of high-temperature carburization in HTGR atmospheres, 9:2251 (J;US)
**Compression Strength**
Oxidation-related strength loss in HTGR graphites, 9:2249 (J;US)
**Corrosion Fatigue**
Materials selection for advanced-HTGR component development, 9:2250 (J;US)
**Creep**
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
**Embrittlement**
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Fracture Mechanics**
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
**Fracture Properties**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
**Mechanical Tests**
Development of an apparatus for testing fatigue of metals at elevated temperatures in controlled environments, 9:3093 (R;JP;In Japanese)
**Oxidation**
Recent developments in graphite for HTGR applications, 9:2248 (J;US)
**Physical Radiation Effects**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
In-reactor creep behavior of selected ferritic alloys, 9:2279 (R;US)
Light water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Stress Corrosion**
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water (PWR), 9:2215 (R;US)
**Thermal Conductivity**
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
**Thermal Degradation**
Oxidation-related strength loss in HTGR graphites, 9:2249 (J;US)
The kinetics of high-temperature carburization in HTGR atmospheres, 9:2251 (J;US)
**Thermal Diffusivity**
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
**Transition Temperature**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)

**REACTOR NOISE**
**Acoustic Monitoring**
Location procedure for sound sources in reactor-technical enclosures, 9:2340 (R;DD)

**REACTOR OPERATION**
**Control Rooms**
Improvements and standardization of communication means for control room personnel in nuclear power plants, 9:2338 (R;DE;In German)
**Lectures**
Dynamics of a nuclear power plant. Behaviour of PWR plants in normal and upset operation, 9:2415 (R;DE)
**Pressure Gradients**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)
**Technology Transfer**
A functional system definition for operations, testing, and training, 9:2470 (J;US)
Experience that contribute to operation and maintenance technology transfer, 9:2471 (J;US)
Nuclear customer services, 9:2469 (J;US)
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
**Temperature Gradients**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)

**REACTOR PHYSICS**
*Use only for indexing articles of very broad coverage, such as annual reviews, text book, etc.*
JNDC nuclear data library of fission products, 9:3909 (R;JP)
**Perturbation Theory**
Response to "comments on 'the effects of intracell adjoint flux heterogeneity on first-order perturbation reactivity calculations'", 9:2324 (J;US)
**Research Programs**
Progress report 1979-1981, 9:2316 (R;AT;In German)
**Standards**
American National Standard: requirements for reference reactor-physics measurements, 9:2326 (B;US)

**REACTOR SAFETY**
**Heat Transfer**
One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program (BWR), 9:2406 (R;US)
**Hydraulics**
One-dimensional nodal neutronics routines for the TRAC-BD1 thermal-hydraulics program (BWR), 9:2406 (R;US)
**International Cooperation**
International exchange of knowledge with regard to safety, 9:2481 (J;US)
**Lectures**
Dynamics of a nuclear power plant. Behaviour of PWR plants during malfunctions and accidents, 9:2414 (R;DE)
Layout of the components: Primary system components (class I), 9:2416 (R;DE)
**Safety Standards**
Reactor safety. Some current realities, 9:2423 (RA;CA)
**Technology Transfer**
Development and organization of the industry/NRC procedures guide, 9:2487 (BA;US)
International exchange of knowledge with regard to safety, 9:2481 (J;US)

**REACTOR SIMULATORS**
**Technology Transfer**
Simulator training for nuclear power plant operation in Brazil, 9:2478 (J;US)
**Training**
Simulator training for nuclear power plant operation in Brazil, 9:2478 (J;US)

**REACTOR SITES**
**Geologic Faults**
American National Standard: criteria and guidelines for assessing capability for surface faulting at nuclear power plant sites, 9:2504 (B;US)
**Seismology**
American National Standard: criteria and guidelines for assessing capability for surface faulting at nuclear power plant sites, 9:2504 (B;US)

**Standards**
American National Standard: criteria and guidelines for assessing capability for surface faulting at nuclear power plant sites, 9:2504 (B;US)

**REACTOR SITING**
*See SITE SELECTION*

**REACTOR TECHNOLOGY**
**Coordinated Research Programs**
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)
**Education**
Education-prerequisite to adequate technology transfer, 9:2474 (J;US)
Transfer of science, education, and basic nuclear technology, 9:2475 (J;US)
**International Cooperation**
Transfer of science, education, and basic nuclear technology, 9:2475 (J;US)
**Professional Personnel**
Training of technicians in the nuclear field: university/industry collaboration, 9:2476 (J;US)
**Technology Transfer**
Role of the research and development center in the introduction of nuclear power in developing countries - Indian experience, 9:2394 (J;US)
Transfer of science, education, and basic nuclear technology, 9:2475 (J;US)
**Training**
Training of technicians in the nuclear field: university/industry collaboration, 9:2476 (J;US)

**REACTOR VESSELS**
*For nonpressurized containers of reactor cores and associated components.*
**Computer-Aided Design**
Scoping calculations for design and analysis of large reactor vessels for liquid-metal fast breeder reactor (LMFBR) plants, 9:2296 (BA;US)
**Specifications**
Scoping calculations for design and analysis of large reactor vessels for liquid-metal fast breeder reactor (LMFBR) plants, 9:2296 (BA;US)

**RECYCLE (FUEL)**
*See FUEL CYCLE*

**RECYCLING (FUEL)**
*See REPROCESSING*

**REDUCING AGENTS**
**Chemical Preparation**
New polyconjugated oxidation-reduction polymers, as well as a method and apparatus for electrochemical regeneration, 9:2960 (TG;US)

**REFERENCE MAN**
**Depth Dose Distributions**
Calculation of dose from external photon exposures using reference human phantoms and Monte-Carlo methods. Pt. 1, 9:3973 (R;DE)

**REFLECTION**
**Response Functions**
Optical properties of quasi-two-dimensional systems, 9:2820 (RA;BR;In Spanish)

**REFLECTIVE COATINGS**
**Damage**
Scandium oxide coatings for high-power UV laser applications, 9:2741 (J;US)

**REFRACTORIES**
**Corrosion**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Erosion**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Materials**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)
**Valves**
Materials evaluation at the H-Coal Pilot Plant, 9:1755 (R;US)

**REFRIGERATORS**
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)

**REFUSE**
*See SOLID WASTES*

**REFUSE DERIVED FUELS**
**Cocombustion**
RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2086 (R;US)
**Economics**
RDF (refuse derived fuel) utilization in a navy oil-fired boiler. Final report Dec 82-May 83, 9:2086 (R;US)

**REFUSE-FUELED POWER PLANTS**
**Feasibility Studies**
Resource Recovery Co-Disposal Demonstration Project, Middlesex County, New Jersey: feasibility study and recommendation for implementation. Final report, 9:2655 (R;US)

**REGGE POLES**
Triple Reggeon interactions and Reggeon dynamics in high-energy collisions, 9:3734 (R;US)

**REGION IV**
*See FEDERAL REGION IV*

**REGION X**
*See FEDERAL REGION X*

**RELATIVISTIC BEAM INJECTION**
Formation of relativistic electron beam rings in a conducting cavity, 9:4068 (R;JP)
**Ring Currents**
Evolution of ring current formed by relativistic electron beam injection into a charge but not current neutralizing plasma, 9:4066 (R;JP)

**RELEASE (FISSION PRODUCT)**
*See FISSION PRODUCT RELEASE*

**RENEWABLE ENERGY SOURCES**
*See also BIOMASS*
*SOLAR ENERGY*
*WAVE POWER*
**Economic Analysis**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Energy Source Development**
New, renewable energy sources in the Norwegian energy production system. Summary report, 9:2570 (R;NO;In Norwegian)
**Research Programs**
Energy supplies. Proposals for research and development after 1984, 9:2572 (R;SE;In Swedish)

**REPROCESSING**
*See also PUREX PROCESS*
**Ion Exchange**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)

**REPRODUCTIVE DISORDERS**
**Epidemiology**
Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review, 9:3408 (R;SE;In Swedish)
**Reviews**
Toxicologic effects of air pollution on reproduction. Epidemiological studies - literature review, 9:3408 (R;SE;In Swedish)

**RESEARCH AND TEST REACTORS**
*See also RESEARCH REACTORS*
*TRIGA TYPE REACTORS*
**Fuel Elements**
Contribution of French industry to RERTR (state of development in September 1980), 9:2356 (RA;US)
Irradiation tests of fuel and fuel elements under the German AF program - revised test program, 9:2362 (RA;US)
JAERI RERTR program, 9:2348 (RA;US)
Study of $UO_2$ wafer fuel for very high-power research reactors, 9:2364 (RA;US)

**Fuel Plates**
Irradiation testing of miniature fuel plates for the RERTR program, 9:2352 (RA;US)
Status of uranium-silicon alloy fuel development for the RERTR program, 9:2351 (RA;US)
Status of fuel element technology for plate type dispersion fuels with high uranium density, 9:2355 (RA;US)
**JAERI**
JAERI RERTR program, 9:2348 (RA;US)
**Meetings**
Proceedings of the international meeting on development, fabrication and application of reduced enrichment fuels for research and test reactors, 9:2346 (R;US)
**Ponds**
Effect of cooking on radionuclide concentrations in waterfowl tissues, 9:3331 (RA;US)
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**Reactor Safety**
Safety analysis calculations for research and test reactors, 9:2365 (RA;US)

**RESEARCH PROGRAMS**
*To be used jointly with descriptor(s) for subject field and/or organization concerned.*
**Planning**
Energy supplies. Proposals for research and development after 1984, 9:2572 (R;SE;In Swedish)
Probabilistic planning and budgeting for R & D programs involving activities of high uncertainty, 9:4236 (R;US)
Selection of an energy R and D portfolio for the European Community. Part II. A data handbook of probability assessments for energy technologies, 9:4235 (R;XE)

**RESEARCH REACTORS**
*See also BER-2 REACTOR*
*DEMOCRITUS REACTOR*
*DIDO REACTOR*
*DR-3 REACTOR*
*FFTF REACTOR*
*FMRB REACTOR*
*FNR REACTOR*
*FR-2 REACTOR*
*FRM REACTOR*
*IIFR REACTOR*
*IEAR-1 REACTOR*
*JEN-1 REACTOR*
*JRR-2 REACTOR*
*JRR-3 REACTOR*
*JRR-4 REACTOR*
*KUHFR REACTOR*
*KUR REACTOR*
*NCSCR-1 REACTOR*
*NRU REACTOR*
*NRX REACTOR*
*NSRR REACTOR*
*OSIRIS REACTOR*
*R-A REACTOR*
*RA-3 REACTOR*
*SLOWPOKE TYPE REACTORS*
**Federal Republic of Germany**
Objectives and status of the German AF program, 9:2347 (RA;US)
**Fuel Elements**
Note on experience with MTR fuel in the United Kingdom, 9:2350 (RA;US)
Objectives and status of the German AF program, 9:2347 (RA;US)
**Fuel Plates**
Producibility studies using UAl/sub x/ for low enrichment fuel plates, 9:2354 (RA;US)
**International Cooperation**
Responsibilities and tasks of nuclear research centers in developing countries, 9:2393 (J;US)
**Reactor Decommissioning**
American National Standard: for decommissioning of research reactors, 9:2505 (B;US)
**Technology Transfer**
Responsibilities and tasks of nuclear research centers in developing countries, 9:2393 (J;US)

**RESERVOIR ROCK**
**Simulation**
Some geological modeling aspects of reservoir simulation (Lenticular sandstones), 9:1867 (RA;US)

**RESID**
*See PETROLEUM RESIDUES*

**RESIDENCES**
*See HOUSES*

**RESIDENTIAL BUILDINGS**
*See also APARTMENT BUILDINGS*
*HOUSES*
**Cooling Load**
Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices, 9:2608 (R;US)
**Design**
Affordable manufactured housing through energy conservation: using the slide rule and modifiers, 9:2607 (R;US)
**Energy Audits**
Comparison of actual electricity savings with audit predictions in the BPA residential weatherization pilot program, 9:2622 (R;US)
Verification of the DOE Model Audit, 9:2621 (R;US)
**Energy Conservation**
Affordable manufactured housing through energy conservation: using the slide rule and modifiers, 9:2607 (R;US)
Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report, 9:2618 (R;US)
Residential conservation demonstration program. Final report, 9:2616 (R;US)
Residential conservation investments: a practical guide to retrofitting, 9:2624 (R;US)
**Energy Efficiency**
Affordable manufactured housing through energy conservation: a guide to designing and constructing energy-efficient manufactured homes, 9:2606 (R;US)
**Fuel Cell Power Plants**
Economic competitiveness of fuel cell onsite integrated energy systems, 9:2584 (R;US)
**Heating Load**
Affordable manufactured housing through energy conservation: a guide to designing and construcint energy-efficient manufactured homes. Technical support document 2: appendices, 9:2608 (R;US)
**Weatherization**
Maximally cost-effective residential retrofit demonstration program. Residential Conservation Demonstration Program. Final report, 9:2618 (R;US)

**RESIDENTIAL SECTOR**
**Energy Analysis**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)

**RESIDUAL OILS**
*See PETROLEUM RESIDUES*

**RESIDUES (RADIOACTIVE)**
*See RADIOACTIVE WASTES*

**RESINS**
**Chemical Radiation Effects**
Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3027 (R;US)
**Chemical Reaction Kinetics**
Kinetic features of an intraresin reaction, 9:2989 (J;US)
**Photochemistry**
Radiation curing of inks and coatings. Annual report 1 Oct 81-30 Sep 82, 9:3027 (R;US)

**RESONANCE CAVITIES**
*See CAVITY RESONATORS*

**RESONATORS**
*See also CAVITY RESONATORS*

**Physical Radiation Effects**
Modification of point defects in quartz for device applications, 9:2829 (R;US)
**RESOURCE RECOVERY FACILITIES**
**Feasibility Studies**
Resource Recovery Co-Disposal Demonstration Project, Middlesex County, New Jersey: feasibility study and recommendation for implementation. Final report, 9:2655 (R;US)
**RESPIRABLE DUSTS**
*See DUSTS*
**RESPIRATORY SYSTEM DISEASES**
**Epidemiology**
Respiratory effects of air pollutants, 9:3410 (R;SE;In Swedish)
**RETROFITTING**
**Baseline Ecology**
Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada, 9:2185 (R;US)
**Environmental Effects**
Environmental assessment: conversion to coal Sierra Pacific Power Company, Ft. Churchill Generating Station, units 1 and 2, Wabuska, Lyon County, Nevada, 9:2185 (R;US)
**REVERSE-FIELD PINCH**
**Magnetic Field Reversal**
Sustained self-reversal in the reversed field pinch, 9:4150 (R;US)
**Magnetohydrodynamics**
Reversed field pinch dynamics and transport studies. Quarterly progress report, 20 July 1983-20 October 1983, 9:4043 (R;US)
**Plasma Confinement**
Experimental studies of field-reversed configuration confinement in FRX-C, 9:4131 (BA;XA)
**Plasma Diagnostics**
Soft X-ray imaging diagnostic on the HBTX 1A reversed field pinch, 9:4035 (R;GB)
**Transport Theory**
Reversed field pinch dynamics and transport studies. Quarterly progress report, 20 July 1983-20 October 1983, 9:4043 (R;US)
**RHEINSBERG AKW1 REACTOR**
**Neutron Flux**
Evaluation of neutron flux density and power density with SPN-detectors and micro calorimeters. A comparison, 9:2207 (R;DD)
**Self-Powered Neutron Detectors**
Evaluation of neutron flux density and power density with SPN-detectors and micro calorimeters. A comparison, 9:2207 (R;DD)
**RHENIUM**
**Solvent Extraction**
Basic science and technology, 9:1928 (RA;US)
**RHENIUM COMPLEXES**
**Chemical Preparation**
Synthesis and chemistry of chiral vinyl rhenium complexes (eta-$C_5H_5$)Re(NO)($PPh_3$)(CH==CHR). Stereoselective reactions with electrophiles and a spontaneous alkylidene to olefin rearrangement, 9:2924 (J;US)
**Stereochemistry**
Synthesis and chemistry of chiral vinyl rhenium complexes (eta-$C_5H_5$)Re(NO)($PPh_3$)(CH==CHR). Stereoselective reactions with electrophiles and a spontaneous alkylidene to olefin rearrangement, 9:2924 (J;US)
**Structural Chemical Analysis**
Synthesis and chemistry of chiral vinyl rhenium complexes (eta-$C_5H_5$)Re(NO)($PPh_3$)(CH==CHR). Stereoselective reactions with electrophiles and a spontaneous alkylidene to olefin rearrangement, 9:2924 (J;US)
**RHODIUM**
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Coatings**
Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)
**Electronic Structure**
Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)
**Self-Diffusion**
Theoretical studies of surface diffusion: Self-diffusion in the fcc(100) system, 9:2726 (J;US)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Surface Properties**
Theoretical studies of surface diffusion: Self-diffusion in the fcc(100) system, 9:2726 (J;US)
**RHODIUM 106**
**Uptake**
In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant, 9:3286 (R;FR;In French)
**RHODIUM BORIDES**
**Critical Field**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**Superconductivity**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**RHODIUM COMPLEXES**
**Catalytic Effects**
Coordinately unsaturated clusters. A novel catalytic reaction, 9:2982 (J;US)
**RICE**
**Biological Radiation Effects**
Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3387 (R;FR;In French)
**RICHLAND FFTF REACTOR**
*See FFTF REACTOR*
**RIEMANN WAVES**
*See SHOCK WAVES*
**RING LASERS**
**Design**
Combination ring cavity and backward raman waveguide amplifier, 9:3080 (P;US)
**Waveguides**
Combination ring cavity and backward raman waveguide amplifier, 9:3080 (P;US)
**RINGOTRON**
*See ELECTRON-RING ACCELERATORS*
**RINGS (STORAGE)**
*See STORAGE RINGS*
**RISA**
*See ORGANIC IODINE COMPOUNDS*
**RISER CRACKING**
*See COAL LIQUEFACTION*
**RISK ASSESSMENT**
Interim results of the accident sequence evaluation program (ASEP) (PWR; BWR), 9:2451 (R;US)
Organization for the performance of PRA programs, 9:2488 (BA;US)
Reactor safety. Some current realities, 9:2423 (RA;CA)
Realistic estimates of the consequences of nuclear accidents, 9:2424 (RA;CA)
**Computerized Simulation**
Variance reduction in simulation, 9:2486 (BA;US)
**Human Factors**
IREP human reliability analysis, 9:2495 (BA;US)
**Mathematical Models**
Variance reduction in simulation, 9:2486 (BA;US)
**ROAD TESTS**
**Fuel Consumption**
Fuel and tyre costs and driving comfort on the surface dressing, 9:2636 (R;FI;In Finnish)
**ROCKS**
**Fractures**
Investigation of equivalent porous medium permeability in networks of discontinuous fractures, 9:3436 (R;US)

**Permeability**
Investigation of equivalent porous medium permeability in networks of discontinuous fractures, 9:3436 (R;US)

**ROD BUNDLES**
**Two-Phase Flow**
Detection of flow mixing processes using transmission methods in high-duty heat exchanging apparatus. Final report for the sub-project E6, 9:3082 (R;DE;In German)

**RODENTS**
*See also RATS*
**Behavior**
Preliminary report of biological intrusion studies at the Idaho National Engineering Laboratory subsurface disposal area, 9:1941 (RA;US)
Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area, 9:3294 (RA;US)
**Contamination**
Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area, 9:3294 (RA;US)
**Ecology**
Effects of a controlled fire on small rodent populations in a sagebrush community, 9:3308 (RA;US)
**Population Density**
Long-term studies of relative density of rodents on the Idaho National Engineering Laboratory, 9:3316 (RA;US)
Population ecology of small mammals on the radioactive waste management complex, Idaho National Engineering Laboratory, 9:3290 (RA;US)
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)
Rodent movements, densities and radionuclide concentrations at a liquid radioactive waste disposal area, 9:3294 (RA;US)
**Population Dynamics**
Small mammal density and movement on the SL-1 disposal area, Idaho National Engineering Laboratory, 9:3291 (RA;US)
**Predator-Prey Interactions**
Relative abundance of coyotes, lagomorphs, and rodents on the Idaho National Engineering Laboratory, 9:3314 (RA;US)
**Radiation Doses**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)

**RODS (CONTROL)**
*See CONTROL ELEMENTS*

**RODS (FUEL)**
*See FUEL RODS*

**ROUGHNESS**
**Diffraction**
An estimate of the surface roughness effect, 9:3992 (J;DK)

**RUBBERS**
**Energy Losses**
Viscoelastic loss characteristics of cord rubber composites, 9:2802 (R;US)

**RUBIDIUM**
**Neutron Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**Proton Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)

**RUBIDIUM 95**
**Delayed Neutrons**
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3899 (R;US)

**RUBIDIUM 97**
**Delayed Neutrons**
Studies of neutron resonances in far-unstable nuclides via beta-delayed neutron energy spectra, 9:3899 (R;US)

**RUBIDIUM CARBIDES**
**Neutron Diffraction**
Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite, 9:2779 (J;US)
**Phonons**
Neutron spectroscopy of phonons in stage-1 rubidium-intercalated graphite, 9:2779 (J;US)

**RUBIDIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)

**RUBIDIUM ISOTOPES**
*See also RUBIDIUM 95*
*RUBIDIUM 97*
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)

**RUBY**
**Sorptive Properties**
Electron correlation and hole localization in photon-stimulated ion desorption from solid $N_2$, CO, and $C_2H_2$, 9:2930 (J;US)

**RUSSELLVILLE-1 ARKANSAS REACTOR**
*See ARKANSAS-1 REACTOR*

**RUSSELLVILLE-2 ARKANSAS REACTOR**
*See ARKANSAS-2 REACTOR*

**RUTHENIUM**
**Absorption Spectra**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Catalytic Effects**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Chemical Preparation**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Infrared Spectra**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Sorptive Properties**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)

**RUTHENIUM 106**
**Uptake**
In situ responses of a biological indicator Mytilus edulis L. to the variations of radionuclide discharges from a fuel reprocessing plant, 9:3286 (R;FR;In French)

**RUTHENIUM CHLORIDES**
**Adsorption**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Decomposition**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)

**RUTHENIUM COMPLEXES**
**Absorption Spectra**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
**Electron Transfer**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)

**PH Value**
Bronsted acidities of carbonyl hydride complexes of iron, ruthenium, and osmium: pK/sub a/ values and deprotonation rates in methanol solution, 9:2955 (J;US)
**Photochemical Reactions**
Aspects of artificial photosynthesis. Photosensitized electron transfer and charge separation in redox active surfactant aggregates, 9:3010 (J;US)
Characterization and photochemistry of surface-confined mononuclear and trinuclear phosphine/carbonyl complexes of ruthenium(0). Interim technical report, 9:2997 (R;US)
Synthesis, structure, and photochemistry of tetracarbonyl(fulvalene)diruthenium. Thermally reversible photoisomerization involving carbon-carbon bond activation at a dimetal center, 9:3015 (J;US)
**Structural Chemical Analysis**
Synthesis, structure, and photochemistry of tetracarbonyl(fulvalene)diruthenium. Thermally reversible photoisomerization involving carbon-carbon bond activation at a dimetal center, 9:3015 (J;US)

**RUTHENIUM OXIDES**
**Adsorption**
Volatilization and trapping of ruthenium during calcination of nitric acid solutions, 9:1954 (RA;XA)

**RUTHERFORD SCATTERING**
**Optical Theorem**
Optical theorem and forward glory effects in heavy-ion scattering, 9:3942 (R;BR)

## S

**SABOTAGE**
**Alarm Systems**
Nuclear facility threat analysis and tactical-response procedures, 9:2467 (B;US)
**Emergency Plans**
Nuclear facility threat analysis and tactical-response procedures, 9:2467 (B;US)

**SACCHARIDES**
*See also POLYSACCHARIDES*
**Biological Effects**
Food quality of Aufwuchs from artificial streams receiving low levels of perturbations, 9:3420 (J;US)

**SAFE LOW POWER CRITICAL EXPERIMENT**
*See SLOWPOKE TYPE REACTORS*

**SAFEGUARDS**
*See also IAEA SAFEGUARDS*
**Activation Detectors**
Implementation of the active neutron coincidence collar for the verification of unirradiated PWR and BWR fuel assemblies, 9:2056 (BA;XA)

**SAFETY**
*For general aspects of safety and protection of personnel.*
*See also REACTOR SAFETY*
**Regulations**
Royal Decree 1157/1982 of 30 April approving the Statute of the Nuclear Safety Council, 9:4264 (R;ES;In Spanish)

**SAFETY (NUCLEAR)**
*See RADIATION PROTECTION*

**SAFETY (REACTOR)**
*See REACTOR SAFETY*

**SAFETY STANDARDS**
**International Control**
National and international standards in nuclear technology transfer, 9:2482 (J;US)
**National Control**
National and international standards in nuclear technology transfer, 9:2482 (J;US)
**Technology Transfer**
IRAM toward standardization in the nuclear field, 9:2484 (J;US)
National and international standards in nuclear technology transfer, 9:2482 (J;US)
Standardization and nuclear independence, 9:2483 (J;US)

**SALINE ZONE**
*See OIL SHALES*

**SALTON SEA GEOTHERMAL FIELD**
**Resource Development**
Imperial County geothermal development annual meeting: summary, 9:2150 (R;US)

**SAMARIUM 144**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)
**High Spin States**
Spherical, oblate, and prolate nuclear shapes near $^{146}$Gd, 9:3914 (J;US)

**SAMARIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)

**SAMARIUM BORIDES**
**Electric Conductivity**
Study of the energy gap in single crystal $SmB_6$, 9:2793 (BA;NL)
**Electron Spectroscopy**
Electron tunneling spectroscopy of intermediate valence materials, 9:2747 (BA;NL)
**Energy Gap**
Study of the energy gap in single crystal $SmB_6$, 9:2793 (BA;NL)

**SAMARIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)

**SAMARIUM SULFIDES**
**Electron Spectroscopy**
Electron tunneling spectroscopy of intermediate valence materials, 9:2747 (BA;NL)
**Phonons**
Lattice dynamics of the intermediate valence compounds Sm/sub 0.75/Y/sub 0.25/S and TmSe, 9:2871 (BA;NL)

**SAMPLE HOLDERS**
**Baking**
Temporary support for a UHV sample manipulator during bakeout, 9:3099 (J;US)
**Retrofitting**
Temporary support for a UHV sample manipulator during bakeout, 9:3099 (J;US)

**SAMPLING**
**Quality Assurance**
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3275 (R;US)

**SAND**
**Mechanical Properties**
Mechanical property measurements on Nellis Baseline Sand and Dry CARES Sand, 9:3437 (R;US)

**SANDIA LABORATORIES**
**Environmental Impacts**
Lawrence Livermore National Laboratory and Sandia National Laboratories--Livermore sites, Livermore, California, 9:3339 (J;US)
**Research Programs**
New lead-acid battery designed by Sandia National Laboratories, 9:2525 (J;US)

**SANDSTONES**
**Simulation**
Some geological modeling aspects of reservoir simulation, 9:1867 (RA;US)

**SANITARY LANDFILLS**
**Socio-Economic Factors**
Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities, 9:3338 (R;US)

**SAPHIR REACTOR**
**Fuel Elements**
Comments on applications of reduced enrichment fuels, 9:2372 (RA;US)

SAPPHIRE
Vapor Deposited Coatings
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
SASOL PROCESS
Chemical Effluents
Assessment of discharges from Sasol I Lurgi-based coal gasification plant. Final report Sep 81-Mar 82, 9:1800 (R;US)
SATELLITE POWER SYSTEM
*See ORBITAL SOLAR POWER PLANTS*
SATELLITE SOLAR POWER STATIONS
*See ORBITAL SOLAR POWER PLANTS*
SAVANNAH RIVER
Invertebrates
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3336 (R;US)
Temperature Measurement
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3336 (R;US)
Thermal Pollution
Thermal-effects study, 9:2342 (R;US)
Water Chemistry
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3336 (R;US)
SAVANNAH RIVER PLANT
Environmental Effects
Preliminary biological measurement program in the Savannah River. Final report, 1 March-31 August 1982. Volume II, 9:3336 (R;US)
Fuel Assemblies
Reactivity monitoring during reactor reloading operations, 9:2271 (J;US)
Reactor Fueling
Reactivity monitoring during reactor reloading operations, 9:2271 (J;US)
Reactor Instrumentation
Reactivity monitoring during reactor reloading operations, 9:2271 (J;US)
Thermal Pollution
Thermal-effects study, 9:2342 (R;US)
SAVANNAH RIVER PLANT K REACTOR
*See K REACTOR*
SAVANNAH RIVER PLANT P REACTOR
*See P REACTOR*
SAVANNAH RIVER PLANT R REACTOR
*See R REACTOR*
SCALAR MESONS
Bound State
Do light colored scalars exist?, 9:3848 (J;US)
SCALING
Carbonate scaling - literature review and analysis, 9:2164 (R;US)
SCANDIUM ALLOYS
Electronic Structure
Electronic structure of scandium lithide, 9:2722 (J;US)
SCANDIUM CARBIDES
Chemical Reaction Yield
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
Structural Chemical Analysis
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
SCANDIUM CHLORIDES
Chemical Reaction Yield
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
Chemical Reactions
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
SCANDIUM HYDRIDES
Electronic Structure
Electronic structure of scandium lithide, 9:2722 (J;US)
SCANDIUM OXIDES
Scandium oxide coatings for high-power UV laser applications, 9:2741 (J;US)
SCANNERS (IMAGE)
*See IMAGE SCANNERS*
SCANNING ELECTRON MICROSCOPY
Uses
Applications of microdiffraction with a STEM instrument, 9:3218 (J;US)
SCHIFF BASES
Electrolysis
Reversible sequential transfer of two electrons at the same potential in bis(1,3,5-triketonato)dicopper(II) complexes and their diamine Schiff bases. Effect of $Na^+$ and similar ions on the cyclic voltammetry, 9:2996 (J;US)
SCHMEHAUSEN THTR REACTOR
*See THTR-300 REACTOR*
SCHNELLER NATRIUMGEKUEHLTER REAKTOR
*See SNR-1 REACTOR*
SCHOOL BUILDINGS
Geothermal Space Heating
Description and operation of Haakon School geothermal-heating system, 9:2174 (R;US)
Indoor Air Pollution
Ventilation for control of indoor air quality: a case study (Minnesota), 9:2630 (J;GB)
SCHWINGER VARIATIONAL METHOD
Schwinger variational method for the Bloch equation, 9:4025 (J;US)
SCHWINGER-TOMONAGA FORMALISM
Analytical Solution
New solution for the Schwinger model, 9:3822 (R;XA)
SCINTIGRAPHY
*See SCINTISCANNING*
SCINTISCANNING
Image Processing
Temporal functional analysis of dynamic scintigraphy by application of the Karhunen-Loeve transform, 9:3351 (R;FR;In French)
SCRUBBERS
Electrolytes
Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes, 9:2968 (J;US)
SEA BED
Excavation
Undersea excavation test for the protection of submerged equipment in the arctic seas, 9:1837 (BA;GB)
SEALING MATERIALS
Mechanical Properties
Design and testing of a flexible line suitable for gas transportation (Rilsan and silastene), 9:1894 (BA;GB)
SEALS
*See also SECURITY SEALS*
Fabrication
Fabrication of a hermetically sealed connector, 9:3098 (R;US)
SEAWEEDS
Anaerobic Digestion
Marine biomass program: anaerobic digestion systems development and stability study. Final report 1 Feb-31 Dec 82, 9:2079 (R;US)
SECONDARY BATTERIES
*See ELECTRIC BATTERIES*
SECONDARY RECOVERY
*See ENHANCED RECOVERY*
SECURITY PERSONNEL
Personnel Management
Nuclear facility threat analysis and tactical-response procedures, 9:2467 (B;US)
SECURITY SEALS
Design
Reusable tamper-indicating security seal, 9:3069 (P;US)
SEDIMENTATION
Measuring Methods
Basic science and technology, 9:1928 (RA;US)
SEISMIC EFFECTS
Response Modifying Factors
Effects of site characteristics on near-source recordings of strong ground motion, 9:3432 (R;US)

**SEISMIC SOURCES**
**Evaluation**
Evaluation of the water gun as a marine seismic source, 9:3434 (BA;GB)
**Mathematical Models**
Power and phase spectra for detonating cord, 9:3431 (R;US)
**SEISMIC SURVEYS**
**Data Acquisition Systems**
SN 348 telemetry system, 9:1817 (BA;GB)
**Seismic Sources**
Attempt to control the frequency spectrum transmitted during the implosion generated by a steam gun in offshore seismics (VAPORCHOC), 9:1815 (BA;GB)
Evaluation of the water gun as a marine seismic source, 9:3434 (BA;GB)
**Telemetry**
SN 348 telemetry system, 9:1817 (BA;GB)
**SELENIUM**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Removal**
Theoretical investigation of selected trace elements in coal gasification plants. Final report Mar 78-Nov 79, 9:1773 (R;US)
**Uptake**
Metals in maternal and fetal blood. Investigation of possible variations of the placental barrier function, 9:3406 (R;SE;In Swedish)
**SELENIUM 75**
**Tissue Distribution**
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
**SELENIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**SELF-POWERED NEUTRON DETECTORS**
**Response Functions**
Review of the dynamic response of self-powered flux detectors in CANDU reactors, 9:3173 (RA;CA)
**SEM (MICROSCOPY)**
*See SCANNING ELECTRON MICROSCOPY*
**SEMICONDUCTOR COUNTERS**
*See SEMICONDUCTOR DETECTORS*
**SEMICONDUCTOR DETECTORS**
*See also GE SEMICONDUCTOR DETECTORS*
InAsSb strained-layer superlattices for long wavelength detector applications, 9:3209 (R;US)
**SEMICONDUCTOR JUNCTIONS**
**Heat Treatments**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**Sample Preparation**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**Surface Potential**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**Surface Treatments**
Effects of surface preparation on the properties of metal/CdTe junctions, 9:2843 (J;US)
**SEMICONDUCTOR MATERIALS**
*If possible index also the specific compounds.*
**Annealing**
Melting and laser annealing in semiconductors using 0.485 μm and 0.193 μm pulsed lasers, 9:2872 (BA;NL)
**Defects**
Ion channeling techniques for defect and surface studies, 9:3971 (BA;NL)
**Electroluminescence**
Excited-state processes of relevance to photoelectrochemistry. Technical report, 9:2998 (R;US)
**Laser-Radiation Heating**
Laser processing of semiconductors, 9:2874 (J;US)
**Melting**
Melting and laser annealing in semiconductors using 0.485 μm and 0.193 μm pulsed lasers, 9:2872 (BA;NL)
**Photoluminescence**
Excited-state processes of relevance to photoelectrochemistry. Technical report, 9:2998 (R;US)
**SEMILEPTONIC DECAY**
**Form Factors**
Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons, 9:3747 (R;XA)
**Mass**
Mass and form factor effects in spectrum and width of the semileptonic decays of charmed mesons, 9:3747 (R;XA)
**SENIOR CENTERS**
*See PUBLIC BUILDINGS*
**SENSIBLE HEAT STORAGE**
Aquifer thermal energy storage: a well doublet experiment at increased temperatures, 9:2516 (J;US)
**SEPARATION PROCESSES**
*See also ISOTOPE SEPARATION*
*REPROCESSING*
**Research Programs**
Basic science and technology, 9:1928 (RA;US)
**SEQUESTRENE**
*See EDTA*
**SEWAGE SLUDGE**
**Anaerobic Digestion**
Conversion of sewage sludge by anaerobic elimination of the heterofunction, 9:2656 (R;DE;In German)
**Radiosterilization**
Cesium-137 gamma-source considerations for dry-sludge irradiators, 9:2066 (R;US)
**Waste Processing**
Conversion of sewage sludge by anaerobic elimination of the heterofunction, 9:2656 (R;DE;In German)
**SHALE MINING**
*See OIL SHALE MINING*
**SHEATHS (FUEL)**
*See FUEL CANS*
**SHELL MODELS**
*Nuclear shell models only; for electron shell models use ELECTRONIC STRUCTURE.*
*See also INTERACTING BOSON MODEL*
**Hypernuclei**
Hypernuclear spectroscopy in the p shell, 9:3787 (J;US)
**SHELTERS**
**Blast Effects**
Effects of multiple bursts on structural response, 9:3059 (RA;US)
**Closures**
Blast loading of closures for use on shelters, 9:3055 (RA;US)
**Doors**
DIRECT COURSE blast shelter entranceway and blast door experiments, 9:3056 (RA;US)
**Failures**
Effects of multiple bursts on structural response, 9:3059 (RA;US)
Failure criteria for blast loads structures: a review, 9:3058 (RA;US)
Reliability of residential basements as blast shelters, 9:3061 (RA;US)
**Reliability**
Reliability of engineered basements as blast shelters, 9:3060 (RA;US)
**Testing**
Design validation experiments for the key worker blast shelter, 9:3062 (RA;US)
Tests and analyses of 1/4-scale upgraded nine-bay reinforced concrete basement models, 9:3057 (RA;US)
**SHIELDING**
**Electromagnetic Fields**
Calculation of the shielding effect of solid shell enclosures, 9:3958 (R;GB)

**Research Programs**
Final report on PE-II activities from August 1981-September 1983, 9:4152 (R;US)
**Simulators**
Final report on PE-II activities from August 1981-September 1983, 9:4152 (R;US)
**SHIPMENT**
*See TRANSPORT*
**SHIPS**
*See also SUBMARINES*
**Electronic Guidance**
Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system), 9:1824 (BA;GB)
**Positioning**
Exact medium range (400 kilometres) radiolocation of vessels: the MEROPS system (medium range positioning system), 9:1824 (BA;GB)
**SHOCK TUBES**
Design of blast simulators for nuclear testing, 9:3249 (RA;US)
**SHOCK WAVES**
**Compression**
Optical diagnostics for condensed-phase shock-compressed molecular systems, 9:3223 (R;US)
**Research Programs**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Velocity**
Optically recording interferometer for velocity measurements with subnanosecond resolution, 9:3216 (J;US)
**SHOTFIRING**
*See EXPLOSIVE FRACTURING*
**SHOWER COUNTERS**
*Detects high energy gamma radiation or high energy particles on basis of cascade showers in layered absorbers.*
**Performance Testing**
Test of lead glass shower counters, 9:3192 (R;US)
**SHRUBS**
**Ecology**
Comparison of three methods for estimating vegetal cover, 9:3302 (RA;US)
FActors affecting the distributions of two subspecies of big sagebrush, 9:3305 (RA;US)
New point interception frame for estimating cover of vegetation, 9:3276 (RA;US)
**Inventories**
Baseline vegetation data for a controlled burn site, 9:3278 (RA;US)
Comparison of three methods for estimating vegetal cover, 9:3302 (RA;US)
New point interception frame for estimating cover of vegetation, 9:3276 (RA;US)
**Moisture**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
**Spatial Distribution**
FActors affecting the distributions of two subspecies of big sagebrush, 9:3305 (RA;US)
Sagebrush distributions on the Idaho National Engineering Laboratory, 9:3304 (RA;US)
**SIALON**
*See ALUMINIUM OXIDES*
**SIGMA MINUS**
**Magnetic Moments**
Magnetic moment of the negative sigma hyperon: sigma hyperon-nucleus interactions, 9:3696 (RA;US)
Precision measurement of the magnetic moment of the Σp hyperon, 9:3715 (J;US)
**SIGMA PARTICLES**
*See also SIGMA MINUS*
*SIGMA PLUS*
**Bound State**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
Search for strange dibaryons at KEK and LAMPF II, 9:3638 (RA;US)
**Energy-Level Transitions**
Electromagnetic decays of hyperon-excited states, 9:3769 (RA;US)
**Excited States**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
**Weak Particle Decay**
Formation and decay of kaon-nucleon resonances in light nuclei: a test of excited-state quark wave functions, 9:3651 (RA;US)
**SIGMA PLUS**
**Magnetic Moments**
Precise measurement of the Σi magnetic moment, 9:3723 (J;US)
**Radiative Decay**
Measurement of the decay asymmetry in $\Sigma^+ \rightarrow p\gamma$, 9:3692 (RA;US)
**Weak Hadronic Decay**
Precise measurement of the $\Sigma^+$ magnetic moment, 9:3723 (J;US)
**SIGMA-MINUS ATOMS**
*See HADRONIC ATOMS*
**SILANES**
**Chemical Reactions**
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2908 (R;US)
**Electron Mobility**
Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3025 (R;DE;In German)
**Glow Discharges**
Reactive sputtering of amorphous silicon in Ne, Ar, and Kr, 9:2844 (J;US)
**Mass Spectroscopy**
Diagnostics of a glow discharge used to produce hydrogenated amorphous-silicon films. Quarterly progress report, October 15, 1982-January 14, 1983, 9:2121 (R;US)
**Nuclear Magnetic Resonance**
$^{13}C$ CP/MAS NMR study of molecular motion in n-alkylsilanes bonded to the silica surface, 9:2942 (J;US)
**Photolysis**
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2908 (R;US)
**SILICA**
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Sorptive Properties**
Determination of molecular orientation of monolayer adsorbates by optical second-harmonic generation, 9:2902 (J;US)
**SILICA GEL**
**Dehydration**
$^{29}Si$ NMR study of dehydrated/rehydrated silica gel using cross polarization and magic-angle spinning, 9:2948 (J;US)
**Filtration**
Testing of the filtration efficiency of a silica gel packing for capture of cesium aerosol, 9:1951 (RA;XA)
**Structural Chemical Analysis**
Cross-polarization/magic-angle-spinning silicon-29 nuclear magnetic resonance study of silica gel using trimethylsilane bonding as a probe of surface geometry and reactivity, 9:2962 (J;US)
**Surface Properties**
Cross-polarization/magic-angle-spinning silicon-29 nuclear magnetic resonance study of silica gel using trimethylsilane bonding as a probe of surface geometry and reactivity, 9:2962 (J;US)
**SILICATES**
*See also CALCIUM SILICATES*
*LITHIUM SILICATES*
*MAGNESIUM SILICATES*

**Response Modifying Factors**
Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3387 (R;FR;In French)

**SILICIC ACID**
**Interatomic Forces**
Ab initio calculation of interatomic force constants in $H_6Si_2O_7$ and the bulk modulus of α quartz and α cristobalite, 9:2880 (J;DE)

**SILICON**
**Annealing**
Flash lamp annealing of ion implanted boron profiles, 9:2826 (R;AT;In German)
Rapid thermal annealing of arsenic and boron-implanted silicon, 9:2834 (J;US)
Time-resolved conductance and reflectance measurements of silicon during pulsed-laser annealing, 9:2868 (J;US)
**Casting**
Part 1: Silicon ingot casting. Heat Exchanger Method (HEM), 9:2111 (R;US)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
Phenomenon of the minimum of radiation energy losses of relativistic electrons in the crystal, 9:3959 (R;SU;In Russian)
**Chemical Bonds**
Strain-induced localization and electronically stimulated desorption and dissociation, 9:2840 (J;US)
**Crystal Defects**
Diffuse x-ray scattering for the study of defects in silicon, 9:2878 (BA;NL)
**Crystal Doping**
Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2100 (R;FR;In French)
**Crystal Growth**
Origin of SiC impurities in silicon crystals grown from the melt in vacuums, 9:2115 (R;US)
Part 1: Silicon ingot casting. Heat Exchanger Method (HEM), 9:2111 (R;US)
Proceedings of the Flat-Plate Solar Array Workshop on the Science of Silicon Material Preparation, 9:2117 (R;US)
Silicon crystal growth in vacuum, 9:2114 (R;US)
Single crystal growth of upgraded metallurgical silicon by HEM for photovoltaic applications, 9:2116 (R;US)
**Cutting**
Part 2: Multi-wire slicing. Fixed Abrasive Slicing Technique (FAST), 9:2112 (R;US)
Silicon slicing by fixed abrasive slicing technique, 9:2113 (R;US)
**Dendritic Web Growth Method**
Apparatus for growing a dendritic web, 9:2861 (P;US)
**Deposition**
Proceedings of the Flat-Plate Solar Array Workshop on the Science of Silicon Material Preparation, 9:2117 (R;US)
Substrate temperature dependence of microcrystallinity in plasma-deposited, boron-doped hydrogenated silicon alloys, 9:2831 (J;US)
**Electric Conductivity**
Substrate temperature dependence of microcrystallinity in plasma-deposited, boron-doped hydrogenated silicon alloys, 9:2831 (J;US)
Time-resolved conductance and reflectance measurements of silicon during pulsed-laser annealing, 9:2868 (J;US)
**Erosion**
Velocity and size dependences of the erosion rate in silicon, 9:2877 (J;NL)
**Impurities**
Origin of SiC impurities in silicon crystals grown from the melt in vacuums, 9:2115 (R;US)
Single crystal growth of upgraded metallurgical silicon by HEM for photovoltaic applications, 9:2116 (R;US)
**Ion Implantation**
Flash lamp annealing of ion implanted boron profiles, 9:2826 (R;AT;In German)
Rapid thermal annealing of arsenic and boron-implanted silicon, 9:2834 (J;US)
Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2100 (R;FR;In French)
**Meetings**
Proceedings of the Flat-Plate Solar Array Workshop on the Science of Silicon Material Preparation, 9:2117 (R;US)
**Melting**
Melting phenomenon and properties of defects associated with pulsed laser irradiation, 9:2876 (J;GB)
**Order-Disorder Transformations**
Substrate temperature dependence of microcrystallinity in plasma-deposited, boron-doped hydrogenated silicon alloys, 9:2831 (J;US)
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Positron Channeling**
Some specific features of coherent radiation and particle propagation in crystals, 9:2823 (R;SU;In Russian)
**Raman Spectra**
Importance of temperature-dependent optical properties for Raman-temperature measurements for silicon, 9:2849 (J;US)
**Reflectivity**
Time-resolved conductance and reflectance measurements of silicon during pulsed-laser annealing, 9:2868 (J;US)
**Sorptive Properties**
Hydrogen chemisorption on silicon (100) 2 x 1, 9:2759 (J;NL)
**Sputtering**
Reactive sputtering of amorphous silicon in Ne, Ar, and Kr, 9:2844 (J;US)
**Strains**
Strain-induced localization and electronically stimulated desorption and dissociation, 9:2840 (J;US)
**Traps**
Effects of light and modulation frequency on spin-dependent trapping at silicon grain boundaries, 9:2828 (R;US)
**Vacuum Casting**
Silicon crystal growth in vacuum, 9:2114 (R;US)
**Vapor Deposited Coatings**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)

**SILICON 28**
**Targets**
Some methods and problems associated with making thick (1 mg/cm²) $^{28}$ $^{29}$ $^{30}$silicon targets, 9:3142 (R;US)

**SILICON 28 TARGET**
**Carbon 12 Reactions**
Demonstration of a large deformation in the first stage of the sequence reaction $^{12}C(^{28}Si,\alpha\alpha)^{32}S$(g.s.) by analysis of angular correlation measurements, 9:3883 (R;FR;In French)
**Kaon Plus Reactions**
Tests of the $K^+$-nucleon interaction in nuclei: an inelastic-scattering survey, 9:3873 (RA;US)

**SILICON 29**
**Nuclear Magnetic Resonance**
$^{29}$Si NMR study of dehydrated/rehydrated silica gel using cross polarization and magic-angle spinning, 9:2948 (J;US)
Cross-polarization/magic-angle-spinning silicon-29 nuclear magnetic resonance study of silica gel using trimethylsilane bonding as a probe of surface geometry and reactivity, 9:2962 (J;US)
**Targets**
Some methods and problems associated with making thick (1 mg/cm²) $^{28}$ $^{29}$ $^{30}$silicon targets, 9:3142 (R;US)

**SILICON 30**
**Targets**
Some methods and problems associated with making thick (1 mg/cm²) $^{28}$ $^{29}$ $^{30}$silicon targets, 9:3142 (R;US)

**SILICON ALLOYS**
**Laser-Radiation Heating**
Laser processing of semiconductors, 9:2874 (J;US)
**Physical Radiation Effects**
Kinetics of radiation-induced segregation in Ni—12.7 at. % Si, 9:2719 (J;US)

**Segregation**
Kinetics of radiation-induced segregation in Ni—12.7 at. % Si, 9:2719 (J;US)

**SILICON BORIDES**
**Thermoelectric Conversion**
Materials for high-temperature thermoelectric conversion, 9:2118 (R;US)

**SILICON CARBIDES**
**Chemical Vapor Deposition**
Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2806 (BA;US)
**Radioactivation**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)

**SILICON CHLORIDES**
**Auger Electron Spectroscopy**
Auger spectra of tetrahedral halides and hydrides, 9:3568 (J;US)

**SILICON COMPOUNDS**
*See also SILANES, SILOXANES and SILICONES.*
*See also SILANES*
*SILICATES*
*SILICON BORIDES*
*SILICON CARBIDES*
*SILICON CHLORIDES*
*SILICON FLUORIDES*
*SILICON OXIDES*
**Chemical Reactions**
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2908 (R;US)
**Photolysis**
Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1982-September 30, 1983, 9:2908 (R;US)
**Structural Chemical Analysis**
Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers, 9:2990 (J;US)

**SILICON FLUORIDES**
**Auger Electron Spectroscopy**
Auger spectra of tetrahedral halides and hydrides, 9:3568 (J;US)

**SILICON HYDRIDES**
*See SILANES*

**SILICON IONS**
**Abundance**
Fully ionized and total silicon abundances in the Alcator-C tokamak, 9:4136 (J;US)

**SILICON OXIDES**
*See also CRISTOBALITE*
*QUARTZ*
*SILICA*
**Enthalpy**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)
**Photoelectron Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**Quantity Ratio**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**Specific Heat**
Enthalpy of silicate melts from 1520 to 2600 K under ambient pressure (Liquid $SiO_2$, $CaSiO_3$, and $CaMgSi_2O_6$), 9:2869 (J;US)
**X-Ray Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)

**SILICON SOLAR CELLS**
**Electric Contacts**
Development of metallization process: FSA Project, cell, and module-formation research area. Quarterly technical progress report No. 6329-15 for the period ending June 30, 1983, 9:2102 (R;US)
**Fabrication**
Silicon doping with a new ion implementation method with a pulsed annealing. Solar cells applications, 9:2100 (R;FR;In French)
Silicon slicing by fixed abrasive slicing technique, 9:2113 (R;US)
**Ion Implantation**
Ion implantation of glow discharge amorphous silicon and possible application to solar cell devices, 9:2104 (R;XE)

**SILOXANES**
**Chemical Reactions**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy, 9:1899 (BA;GB)

**SILVER**
**Absorption Spectroscopy**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)
**Adsorption**
Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electronic Structure**
All-electron relativistic calculations on AgH. An investigation of the Cowan-Griffin operator in a molecular species, 9:2957 (J;US)
Electronic structure of metal overlayers on rhodium, 9:2718 (J;US)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Neon 20 Reactions**
$^{20}Ne$ induced peripheral reaction at 30 MeV/nucleon, 9:3869 (R;FR)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
**Quantity Ratio**
Analysis of the Al-Ag thin film system by Rutherford Backscattering Spectroscopy (RBS) and Auger Electron Spectroscopy (AES), 9:2695 (RA;BR;In Spanish)
**Spectrophotometry**
Application of the inductively coupled plasma system to the simultaneous determination of precious metals, 9:2893 (R;ZA)

**SILVER ALLOYS**
**Electronic Structure**
Calculation of self-consistent potentials for substitutionally disordered systems with application to the Ag/sub x/-Pd/sub 1-x/ alloy series, 9:2731 (J;US)
**Muon Probes**
Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass, 9:2720 (J;US)
**Spin-Lattice Relaxation**
Evidence for power-law spin-correlation decay from muon spin relaxation in AgMn spin-glass, 9:2720 (J;US)

**SILVER HYDRIDES**
**Electronic Structure**
All-electron relativistic calculations on AgH. An investigation of the Cowan-Griffin operator in a molecular species, 9:2957 (J;US)
**SIMS**
*See MASS SPECTROSCOPY*
**SIMULATORS (REACTOR)**
*See REACTOR SIMULATORS*
**SINGLE CRYSTALS**
*See MONOCRYSTALS*
**SITE SELECTION**
**Geochemical Surveys**
Nuclear Regulatory Commission programs, 9:2440 (RA;US)
**SITES (REACTOR)**
*See REACTOR SITES*
**SKELETAL FOSSILS**
*See FOSSILS*
**SKELETON**
**Computerized Tomography**
CT examination of the hip, 9:3357 (RA;HU;In Hungarian, English)
**Radiochemical Analysis**
$^{90}Sr$ and $^{137}Cs$ in soil and biota of fallout areas in southern Nevada and Utah, 9:3298 (J;GB)
**Radionuclide Kinetics**
Radium retention in mature beagles injected at 5 years of age, 9:3398 (J;US)
**Scintiscanning**
Tomographic and scintigraphic examinations of the autologic spongiosa transplantat of the infective pseudoarthrosis, 9:3356 (RA;HU;In Hungarian, English)
**Tomography**
Tomographic and scintigraphic examinations of the autologic spongiosa transplantat of the infective pseudoarthrosis, 9:3356 (RA;HU;In Hungarian, English)
**SKIN DISEASES**
**Radiotherapy**
Radiotherapy of acne - a literature survey, 9:3349 (R;FR;In French)
**SLABS**
*Thicker than PLATES, primarily for use in shielding studies.*
**Photon Transport**
Time-dependent scattering in resonance lines, 9:3968 (J;US)
**SLOWPOKE TYPE REACTORS**
**Space Heating**
Small reactors for low-temperature heating, 9:2381 (RA;CA)
**SLUDGES**
*See also SEWAGE SLUDGE*
**Waste Disposal**
Land treatability of refinery and petrochemical sludges. Final report 10 Oct 77-30 Mar 82, 9:1851 (R;US)
**SLUGS (FUEL)**
*See FUEL RODS*
**SLURRIES (FUEL)**
*See FUEL SLURRIES*
**SMOKATRON**
*See ELECTRON-RING ACCELERATORS*
**SMOKES**
**Chemical Analysis**
Chemical characterization and toxicologic evaluation of airborne mixtures. Chemical characterization of combusted inventory red and violet smoke mixes. Final report 1981-1982, 9:3256 (R;US)
**Toxicity**
Chemical characterization and toxicologic evaluation of airborne mixtures. Chemical characterization of combusted inventory red and violet smoke mixes. Final report 1981-1982, 9:3256 (R;US)
**SMOOTHNESS**
*See ROUGHNESS*
**SNAKES**
**Radiation Doses**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)
**SNR REACTOR**
*See SNR-1 REACTOR*
**SNR-1 REACTOR**
*Prior to 1977, SNR REACTOR was used.*
**Public Relations**
Fast breeder reactor at Kalkar. Pt. 2. Uncalculable risk - intolerable risk. Law suit going on, 9:2507 (B;DE;In German)
**Risk Assessment**
Fast breeder reactor at Kalkar. Pt. 2. Uncalculable risk - intolerable risk. Law suit going on, 9:2507 (B;DE;In German)
**SNR-300 REACTOR**
*See SNR-1 REACTOR*
**SO GROUPS**
**Symmetry Breaking**
Discrete symmetries in SO(N) grand unified groups and the survival hypothesis, 9:3789 (R;SU)
**SODIUM**
**Chemical Reactions**
Improved parametrization of diatomics-in-molecules potential energy surface for $Na(3p\ ^2P)+H_2 \rightarrow Na(3s\ ^2S)+H_2$, 9:2953 (J;US)
**Corrosive Effects**
Materials behaviour in the liquid alkali metals lithium and sodium, 9:2742 (B;GB)
**Crystal Structure**
Multilayer relaxation of interlayer registry and spacing at high-index metal surfaces, 9:2712 (J;US)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Fuel-Coolant Interactions**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2277 (R;FR;In French)
**Liquid Metals**
Experimental evidence suppporting two-mechanism critical heat flux, 9:2210 (J;GB)
**Photoionization**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**Photon-Atom Collisions**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**Thermodynamic Properties**
Calculation of thermophysical properties of sodium, 9:2769 (BA;US)
**SODIUM CHLORIDES**
**Specific Heat**
Comparison of experimental values of anti V°₂, anti C/sub P/°₂, and anti C/sub V/°₂ for aqueous NaCl with predictions using the born equation at temperatures from 300 to 573.15 K at 17.7 MPa, 9:2935 (J;US)
**Vapor Deposited Coatings**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**SODIUM CITRATES**
*See SODIUM COMPOUNDS*
**SODIUM COMPOUNDS**
*See also SODIUM CHLORIDES*
**Chemical Reaction Yield**
Supported palladium catalysts for the reduction of sodium bicarbonate to sodium formate in aqueous solution at room temperature and one atmosphere of hydrogen, 9:2917 (J;US)
**Dielectric Properties**
Low-temperature dielectric constant of near-stoichiometric Na $\beta$-alumina, 9:2803 (J;US)
**NMR Spectra**
Supported palladium catalysts for the reduction of sodium bicarbonate to sodium formate in aqueous solution at room temperature and one atmosphere of hydrogen, 9:2917 (J;US)
**SODIUM IODIDE DETECTORS**
*See NAI DETECTORS*
**SODIUM LAURYL SULFATES**
*See SODIUM COMPOUNDS*
**SODIUM-WATER REACTIONS**
*See MOLTEN METAL-WATER REACTIONS*

**SOILING**
*See SURFACE CONTAMINATION*
**SOILS**
**Carcinogen Screening**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3284 (R;US)
**Chemical Analysis**
Dynamics of soil-forming processes in the Arctic, 9:3281 (BA;CA)
**Ingestion**
Seasonal soil ingestion rates by pronghorn and black-tailed jack rabbits, 9:3279 (RA;US)
**Moisture**
Plant and soil water relations at a prescribed burn site on the Idaho National Engineering Laboratory, 9:3311 (RA;US)
**Mutagen Screening**
Protocol for bioassessment of hazardous waste sites. Final report, 9:3284 (R;US)
**Radioactivity**
Ecological vectors of radionuclide transport at a solid radioactive waste disposal facility in southeastern Idaho, 9:3289 (RA;US)
**Radiochemical Analysis**
$^{90}Sr$ and $^{137}Cs$ in soil and biota of fallout areas in southern Nevada and Utah, 9:3298 (J;GB)
Determination of concentrations of selected radionuclides in surface soil in the US, 9:3297 (J;GB)
**Radionuclide Migration**
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)
Uptake of $\gamma$-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)
**SOLAR ARCHITECTURE**
Energy research in Berlin. Solar energy utilization by climate-adjusted planning and building, 9:2593 (R;DE;In German)
**Demonstration Programs**
Experiences with projects and competitions - demonstration projects for solar energy utilization in residential buildings, 9:2136 (RA;DE;In German)
**SOLAR CELLS**
*See also CADMIUM SULFIDE SOLAR CELLS*
*CASCADE SOLAR CELLS*
*CONCENTRATOR SOLAR CELLS*
*GALLIUM ARSENIDE SOLAR CELLS*
*SILICON SOLAR CELLS*
**Fabrication**
Part 2: Multi-wire slicing. Fixed Abrasive Slicing Technique (FAST), 9:2112 (R;US)
**SOLAR COLLECTORS**
**Cost**
Breakeven costs of storage in optimized solar energy systems, 9:2147 (J;GB)
**SOLAR DISTILLATION**
**Flat Plate Collectors**
Solar desalination, 9:2134 (R;FR)
**Osmosis**
Solar desalination, 9:2134 (R;FR)
**SOLAR ENERGY**
**Energy Storage**
Assessment of energy storage for solar applications, 9:2145 (R;US)
Breakeven costs of storage in optimized solar energy systems, 9:2147 (J;GB)
**Legislation**
Building laws and regulations and the utilization of solar energy in the Federal Republic of Germany, 9:2097 (RA;DE;In German)
**SOLAR FLARES**
**Forecasting**
Prediction and identification of cosmic solar radiation flux and spectra, 9:3453 (R;US)
**SOLAR MODELS**
*See STAR MODELS*
**SOLAR NEUTRINOS**
*Prior to July, 1975 information was indexed to NEUTRINOS.*
**Neutrino Detection**
Study of high-energy physics underground. Technical progress report, 9:3166 (R;US)
**Particle Production**
Rate of the $^3He(p, e^+ \nu)^4He$ reaction, 9:3474 (J;US)
**SOLAR PROCESS HEAT**
High temperature solar-thermochemical processing-hydrogen and sulfur from hydrogen sulfide, 9:2129 (J;GB)
**Research Programs**
Solar industrial process heat (IPH) project. Technical report, October 1981-September 1982, 9:2140 (R;US)
**SOLAR PROTON EVENTS**
*See SOLAR PROTONS*
**SOLAR PROTONS**
*Prior to July, 1975 information was indexed to PROTONS.*
**Correlations**
Using solar radio burst integrated fluxes to predict energetic proton flux increases, 9:3454 (R;US)
**Solar Flux**
Using solar radio burst integrated fluxes to predict energetic proton flux increases, 9:3454 (R;US)
**SOLAR RADIO BURSTS**
**Correlations**
Using solar radio burst integrated fluxes to predict energetic proton flux increases, 9:3454 (R;US)
**Emission Spectra**
Persistent 1.5s oscillations superimposed at a solar burst observed at two mm-wavelengths, 9:3467 (R;US)
**Forecasting**
Prediction and identification of cosmic solar radiation flux and spectra, 9:3453 (R;US)
**SOLAR SPACE HEATING**
**Surveys**
Assessment of solar technology in the home-building industry. Final report, 9:2139 (R;US)
**SOLAR SYSTEM EVOLUTION**
**Meetings**
Review lectures IV. Report on the scientific conference in Strasbourg, February 24-26, 1982, 9:3491 (B;DE)
**SOLAR WIND**
**Electron Collisions**
Collisional modification to the exospheric theory of solar wind halo electron pitch angle distributions, 9:3475 (J;US)
**SOLID ELECTROLYTES**
**Failures**
Impurities and solid electrolyte failure, 9:2526 (J;NL)
**Ionic Conductivity**
High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983, 9:2518 (R;US)
**Microstructure**
High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983, 9:2518 (R;US)
**Production**
High-conductivity-protron solid electrolytes. Technical progress report, March 1, 1980-March 1, 1983, 9:2518 (R;US)
**SOLID FUELS**
*See also MIXED OXIDE FUELS*
**Meetings**
Solid fuels technology in the 80s, 9:2091 (R;SE;In Swedish)
**SOLID STATE LASERS**
*See also NEODYMIUM LASERS*
**Capacitors**
Design and construction of large capacitor banks, 9:4189 (R;US)
**Slabs**
Improved solid-state laser sources. Final technical report, 2 June 1981-1 June 1982, 9:3078 (R;US)
**SOLID WASTES**
*See also MINERAL WASTES*
*WOOD WASTES*
**Chemical Analysis**
Evaluation of radium and toxic element leaching characteristics of Florida phosphogypsum stockpiles. Report of investigations/1983, 9:3283 (R;US)
**SOLIDS**
**Charged-Particle Transport**
Stopping power and effective charge of low-velocity ions in metals, 9:4171 (RA;JP;In Japanese)

**Energy-Level Density**
Resonance and pairing effects in the Anderson lattice, 9:3990 (BA;US)
**Ignition**
Spontaneous ignition of solids subjected to linearly time-dependent radiant exposure, 9:3048 (RA;US)
**Ion Collisions**
Desorption by ions and electrons, 9:4170 (RA;JP;In Japanese)
Empirical formulas for the reflection of light ions from solids, 9:4168 (RA;JP)
Reflection of low-energy light-element ions from solid surfaces, 9:4167 (RA;JP)
Reflection of low energy light-element ions from solid surfaces, 9:4169 (RA;JP;In Japanese)
**Nonlocal Potential**
Surface contribution to the optical properties of nonlocal systems, 9:3988 (J;US)
**Optical Properties**
Surface contribution to the optical properties of nonlocal systems, 9:3988 (J;US)
**Sorptive Properties**
Angular distribution of desorpted atoms of solid surfaces, 9:2819 (RA;BR;In Spanish)
Single atom and-molecules chemisorption on solid surfaces, 9:3979 (RA;BR;In Portuguese)
**Thermodynamic Properties**
Chemical potentials in solids, 9:3993 (J;US)

**SOLITONS**
**Commutators**
Fractional charge and anomalous commutators, 9:3840 (R;IL)
**Peierls Method**
Solitons in the Peierls condensate. I phase solitons, 9:3839 (R;IL)
**Phase Studies**
Solitons in the Peierls condensate. I phase solitons, 9:3839 (R;IL)

**SOLVATED ELECTRONS**
**Photoionization**
Experimental investigations on the dynamics and energetics of excess electrons in liquid and gaseous ethane and in liquid tetramethylsilane, 9:3025 (R;DE;In German)

**SOLVENT-REFINED COAL**
**Denitrification**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Desulfurization**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Hydrocracking**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Hydrogenation**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)

**SOLVENT-REFINED COAL PROCESS**
*See SRC PROCESS*

**SOLVENT-REFINING COAL PLANTS**
*See COAL PREPARATION PLANTS*
*SRC PROCESS*

**SOOT**
**Light Scattering**
Scattering and absorption of light by soot particles, 9:4014 (R;US)

**SOUND**
*See SOUND WAVES*

**SOUND WAVES**
*See also ULTRASONIC WAVES*
**Scattering**
Thermoviscous effects on acoustic scattering by thermoelastic solid cylinders and spheres, 9:4018 (J;US)
**Transducers**
Conical transducer for generation of acoustic waves in fluids, 9:3074 (J;US)

**SOUTH AUSTRALIA**
**Uranium Mines**
Roxby Downs (Indenture Ratification) Act, 1982 (No. 52 of 1982), 9:1911 (R;AU)

**SOUTHEAST REGION**
*See FEDERAL REGION IV*

**SOVIET UNION**
*See USSR*

**SPACE HEATERS**
**Thermal Efficiency**
Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2092 (R;NO)

**SPACE HEATING**
*See also SOLAR SPACE HEATING*
**Phase Change Materials**
Thermal-energy storage in crosslinked pellets of high-density polyethylene for home heating and cooling via off-peak electric power utilization, 9:3030 (J;US)

**SPACE HVAC SYSTEMS**
*Heating, ventilation, and air conditioning systems.*
**Control Equipment**
Ventilation for control of indoor air quality: a case study (Minnesota), 9:2630 (J;GB)

**SPACE LATTICES**
*See CRYSTAL LATTICES*

**SPACE POWER REACTORS**
**Feasibility Studies**
Gaseous fuel reactors for power systems, 9:2298 (B;US)
**Research Programs**
Gaseous fuel reactors for power systems, 9:2298 (B;US)

**SPACE VEHICLES**
*See also PIONEER SPACE PROBES*
**Secondary Emission**
Energy distributions and yields of secondary ions and electrons emitted by GIOTTO during Halley encounter, 9:3450 (R;US)

**SPAIN**
**Bilateral Agreements**
Protocol between the National Laboratory of Industrial Engineering and Technology of Portugal and the Junta de Energia Nuclear of Spain on supply and transfer of technology on uranium extraction from phosphoric acid, 9:1913 (R;PT;In Portuguese)
**Nuclear Power Plants**
Maintenance experience in Spain, 9:2473 (J;US)
**Radiation Protection Laws**
26183 - Royal Decree 2519/1982 of 12 August approving the Regulations on Protection Against Ionizing Radiation, 9:4263 (R;ES;In Spanish)

**SPANISH JEN-1 RESEARCH REACTOR**
*See JEN-1 REACTOR*

**SPANISH ORGANIZATIONS**
**Government Policies**
Royal Decree 1157/1982 of 30 April approving the Statute of the Nuclear Safety Council, 9:4264 (R;ES;In Spanish)
**Regulations**
Royal Decree 1157/1982 of 30 April approving the Statute of the Nuclear Safety Council, 9:4264 (R;ES;In Spanish)

**SPEAR**
*Stanford positron-electron asymmetric ring.*
**Kicker Magnets**
SLAC beam scraper (and mask) for MK1 kicker magnet SPEAR 4S5 and 14S15 (Engineering Materials), 9:3160 (E;US)

**SPECIMEN HOLDERS**
*See SAMPLE HOLDERS*

**SPECTRA (NEUTRON)**
*See NEUTRON SPECTRA*

**SPECTROCHEMISTRY**
*See ABSORPTION SPECTROSCOPY*

**SPECTROMETERS**
*See also EPR SPECTROMETERS*
*GAMMA SPECTROMETERS*
*MASS SPECTROMETERS*
*MULTIPARTICLE SPECTROMETERS*
*NEUTRON SPECTROMETERS*
*X-RAY SPECTROMETERS*
**Computerized Control Systems**
Digitally controlled measurement of sonic elastic moduli and internal friction by phase analysis, 9:3213 (J;US)

**SPECTROPHOTOMETRY**
**A Codes**
Atomic-absorption programme for the Apple 2 plus computer, 9:3207 (R;ZA)

**SPENT FUEL CASKS**
**Brittleness**
Value/impact of design criteria for cast ductile iron shipping casks, 9:3067 (R;US)
**Design**
A spent fuel storage system for LMFBR fuel experiments, 9:2289 (J;US)
Value/impact of design criteria for cast ductile iron shipping casks, 9:3067 (R;US)
**Dose Limits**
A spent fuel storage system for LMFBR fuel experiments, 9:2289 (J;US)
**Ductility**
Value/impact of design criteria for cast ductile iron shipping casks, 9:3067 (R;US)
**SPENT FUEL ELEMENTS**
**Chemical Properties**
Characteristics of spent LWR fuel relevant to its storage in geologic repositories, 9:1922 (R;US)
**Isotope Ratio**
Determination of burnup in irradiated nuclear fuels by the method of stable $^{148}$Nd fission products, 9:2336 (B;BR;In Portuguese)
Neutron transmission measurements to determine isotopic content of spent fuel, 9:2033 (J;US)
**Nondestructive Analysis**
Determination of xenon in irradiated nuclear fuel using a shielded electron microprobe, 9:1927 (R;US)
**Physical Properties**
Characteristics of spent LWR fuel relevant to its storage in geologic repositories, 9:1922 (R;US)
**SPENT FUEL STORAGE**
**Fuel Pools**
Different types of intermediate storages, 9:1936 (R;DE)
**Fuel Racks**
Different types of intermediate storages, 9:1936 (R;DE)
**SPENT FUELS**
**Activation Analysis**
Neutron transmission measurements to determine isotopic content of spent fuel, 9:2033 (J;US)
**Chemical Composition**
Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN, 9:1932 (TG;US)
**Containers**
Design of containment for the long-term isolation of irradiated fuel during underground disposal, 9:1970 (RA;CA)
**Isotope Ratio**
Neutron transmission measurements to determine isotopic content of spent fuel, 9:2033 (J;US)
**Radioactivity**
Improved and consistent determination of the nuclear inventory of spent PWR fuel on the basis of cell-burnup methods using KORIGEN, 9:1932 (TG;US)
**Reprocessing**
Integral experiment relating to calibration and interpretation of plutonium solid waste measurements at Dounreay Nuclear Power Development Establishment, 9:1994 (R;US)
**SPHEROMAK DEVICES**
**Stability**
Experimental investigation of the spheromak configuration, 9:4220 (BA;XA)
**SPIN**
**Correlation Functions**
Correlation functions of electronic and nuclear spins in a Heisenberg antiferromagnet semi-infinite medium, 9:3516 (RA;BR;In Portuguese)
**SPIN GLASS STATE**
**Muon Probes**
Studies of magnetic phase transitions with muons (LAMPF II experiment planning), 9:2704 (RA;US)
**Order-Disorder Transformations**
Studies of magnetic phase transitions with muons (LAMPF II experiment planning), 9:2704 (RA;US)
**SPIN-OFF**
*See TECHNOLOGY TRANSFER*
**SPINORS**
**Supersymmetry**
Spinor geometry: A genesis of extended supersymmetry, 9:4030 (R;XA)
**SRC PROCESS**
**Cost**
Parametric cost analysis for advanced energy concepts, 9:1752 (R;US)
**Economic Analysis**
Parametric cost analysis for advanced energy concepts, 9:1752 (R;US)
**SRC-II PROCESS**
**Pilot Plants**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**SRI LANKA**
**Energy Analysis**
Sri Lanka - energy situation 1981/82, 9:2550 (R;DE;In German)
**Energy Policy**
Sri Lanka - energy situation 1981/82, 9:2550 (R;DE;In German)
**Energy Supplies**
Sri Lanka - energy situation 1981/82, 9:2550 (R;DE;In German)
**STABLE ISOTOPES**
*For specific terms, consult the Appendix.*
*See also BERYLLIUM 9*
*CALCIUM 48*
*CARBON 12*
*CARBON 13*
*CHLORINE 37*
*DEUTERIUM*
*EUROPIUM 153*
*HELIUM 3*
*IRON 56*
*IRON 57*
*KRYPTON 84*
*KRYPTON 86*
*LEAD 206*
*NICKEL 62*
*NITROGEN 14*
*NITROGEN 15*
*OXYGEN 16*
*PLATINUM 195*
*SAMARIUM 144*
*SILICON 28*
*SILICON 29*
*SILICON 30*
*TIN 118*
*ZIRCONIUM 90*
**Research Programs**
Stable Isotope Group 1981 progress report, 9:2159 (R;NZ)
**STAINLESS STEEL-304**
**Cracks**
Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method, 9:3092 (R;JP;In Japanese)
**Creep**
Sulfur and phosphorus segregation to creep cavities and grain boundaries in 304 SS, 9:2754 (J;US)
**Deformation**
Nucleation and evolution of strain-induced martensitic (b.c.c.) embryos and substructure in stainless steel: a transmission electron microscope study, 9:2729 (J;US)
**Electrical Testing**
Measurements of fatigue crack length at elevated temperature by D. C. electrical potential method, 9:3092 (R;JP;In Japanese)
**Fatigue**
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2674 (R;US)
**Microstructure**
Sulfur and phosphorus segregation to creep cavities and grain boundaries in 304 SS, 9:2754 (J;US)
**Physical Radiation Effects**
Preliminary small angle neutron scattering investigations of neutron irradiation produced voids, 9:2770 (BA;US)

**STAINLESS STEEL-304L**
**Laser Welding**
Porosity decrease in laser welds of stainless steel using plasma control, 9:2706 (R;US)
**STAINLESS STEEL-316**
**Fracture Properties**
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
**Mechanical Properties**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
**Physical Radiation Effects**
Development of stress-based transient cladding damage correlations and fuel pin breach criteria, 9:2291 (J;US)
Fuel pin cladding transient failure strain criterion, 9:2283 (J;US)
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4165 (RA;JP;In Japanese)
**Thermal Degradation**
LMFBR cladding failure determined by simultaneous integration of kinematic, deformation-rate, and cracking-rate equations, 9:2290 (J;US)
**Yield Strength**
Correlation of yield stress changes in 316 stainless steel irradiated with high-energy and fission neutrons, 9:2683 (R;US)
**STAINLESS STEELS**
*See also STAINLESS STEEL-304 STAINLESS STEEL-304L STAINLESS STEEL-316*
**Microstructure**
Effects of alloy composition and processing on the microstructure of D-9 type stainless steel. Final report, 9:2678 (R;US)
Interface structure of some precipitates in austenitic stainless steels, 9:2757 (BA;US)
**Physical Properties**
Interface structure of some precipitates in austenitic stainless steels, 9:2757 (BA;US)
**Physical Radiation Effects**
MC precipitate characterization in austenitic stainless steel, 9:2763 (BA;US)
**STANDARD MAN**
*See REFERENCE MAN*
**STANDING CROP**
*See BIOMASS*
**STANFORD LINEAR ACCELERATOR CENTER**
**Accelerator Facilities**
Evolution of SLAC and its program, 9:3154 (J;US)
**Construction**
Evolution of SLAC and its program, 9:3154 (J;US)
**STAR ACCRETION**
**Cosmic Gamma Bursts**
Gamma-burst emission from neutron-star accretion, 9:3446 (R;US)
**STAR EVOLUTION**
*See also R PROCESS STAR ACCRETION*
**Star Models**
Comparisons between observational color-magnitude diagrams and synthetic cluster diagrams for young star clusters in the Magellanic Clouds, 9:3452 (R;US)
**STAR MODELS**
*Mathematical models of stars.*
**Equations of State**
Collapse of iron stellar cores, 9:3487 (J;US)
**Nucleosynthesis**
Survey of the core helium flash with dynamic convection, 9:3483 (J;US)
**Numerical Analysis**
Collapse of iron stellar cores, 9:3487 (J;US)
**Star Burning**
Survey of the core helium flash with dynamic convection, 9:3483 (J;US)
**STARFIRE TOKAMAK**
**Thermonuclear Reactor Materials**
Low activation fusion reactor design, 9:4211 (BA;XA)
**STARS**
*See also BINARY STARS NEUTRON STARS VARIABLE STARS*
**Gravitational Collapse**
Collapse of iron stellar cores, 9:3487 (J;US)
**Hydrogen Burning**
Nucleosynthesis of $^{26}$Al at low stellar temperatures, 9:3484 (J;US)
**STATE BUILDINGS**
*See PUBLIC BUILDINGS*
**STATE GOVERNMENT**
**Energy Accounting**
State and local responses to natural gas price increases, 9:2553 (R;US)
**STATIONARY POLLUTANT SOURCES**
*Used for general articles when sources are not named. See also specific stationary sources, e.g., Fossil-fuel Power Plants.*
**Audits**
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3275 (R;US)
**STATISTICAL MECHANICS**
**Correlation Functions**
Can the velocity autocorrelation function decay exponentially?, 9:4019 (J;US)
**STATISTICS**
*Limited to the indexing of information on the mathematical discipline of statistics or its application in other scientific disciplines; for indexing numerical values of a statistical nature use STATISTICAL DATA.*
Accuracy functions for confidence bounds: a basis for sample size determination, 9:4253 (D;US)
**STEAM**
**Corrosive Effects**
Long term corrosion of Cr-Mo steels in superheated steam at 482 and 538 C, 9:2743 (J;US)
**Mixing**
Hydrogen mixing in compartments with a high-velocity source, 9:2409 (R;US)
**STEAM COOLANT**
*See STEAM*
**STEAM GENERATORS**
**Corrosion**
Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants, 9:2278 (R;FR;In French)
**Erosion**
Theoretical and experimental study of a reactive steam jet in molten sodium. Application to the wastage of steam generators of FBR power plants, 9:2278 (R;FR;In French)
**Heat Transfer**
Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes (LMFBR), 9:2275 (R;US)
**Hydraulics**
Dynamic stability experimental/analytical program results on a multiple tube sodium heated steam generator model employing double wall tubes (LMFBR), 9:2275 (R;US)
**Repair**
600 MW steam generator repair program. Hydraulically expanded tube to tubesheet joints, 9:2259 (RA;CA)
**Tubes**
600 MW steam generator repair program. Hydraulically expanded tube to tubesheet joints, 9:2259 (RA;CA)
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water (PWR), 9:2215 (R;US)
**STEAM INJECTION**
**Bench-Scale Experiments**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
Maximizing steam-drive recovery in light-oil systems. Final report, 9:1819 (R;US)

**Computerized Simulation**
Maximizing steam-drive recovery in light-oil systems. Final report, 9:1819 (R;US)
**Field Tests**
Development of methods for production of tar-oil in the Federal Republic of Germany, 9:1843 (BA;GB)
**STEEL INDUSTRY**
*See METAL INDUSTRY*
**STEEL-ASTM-A508**
**Cylinders**
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
**Fracture Properties**
Application of crack arrest theory to a thermal shock experiment, 9:2237 (BA;US)
**STEELS**
*See also NICKEL STEELS*
*STAINLESS STEELS*
*STEEL-ASTM-A508*
**Chemical Radiation Effects**
Measurement of corrosion of mild steel in high temperature-pressure pure water under γ-irradiation, 9:2702 (R;JP;In Japanese)
**Corrosion**
Measurement of corrosion of mild steel in high temperature-pressure pure water under γ-irradiation, 9:2702 (R;JP;In Japanese)
**Deformation**
Dynamic recrystallization during the transient deformation of a vanadium microalloyed steel, 9:2724 (J;US)
**Embrittlement**
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Fatigue**
Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen (34CrMo4; 40Mn4), 9:2750 (TG;US)
**Fracture Properties**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
**Hydrogen Embrittlement**
Comparison of experimental procedures for investigating the tendency for hydrogen embrittlement of steels used for the storage and transport of hydrogen gas. Investigation of the development of fatigue cracking in pressure-vessel steels in the presence of hydrogen (34CrMo4; 40Mn4), 9:2750 (TG;US)
Gathering of material on regulations and specifications in nuclear engineering, concerning materials calculation and testing in consideration of the safety requirements of the licensing and supervisory procedures (constructional materials and components of nuclear power plants). 6. technical report. Review of the state of knowledge about hydrogen embrittlement of materials used in conventional and nuclear power plants, 9:2701 (R;DE;In German)
Investigation of hydrogen embrittlement of steels for hydrogen flasks and pressure vessels, 9:2681 (R;XE;GE)
**Mechanical Tests**
Concrete structures for the extraction, storage and carriage of hydrocarbons in offshore areas, 9:1834 (BA;GB)
**Physical Radiation Effects**
Light-water-reactor pressure-vessel surveillance dosimetry using solid-state track recorders, 9:2199 (R;US)
Pressure vessel steel irradiation embrittlement formulas derived from PWR surveillance data, 9:2230 (J;US)
**Recrystallization**
Dynamic recrystallization during the transient deformation of a vanadium microalloyed steel, 9:2724 (J;US)
**Transition Temperature**
An empirical evaluation of a transition temperature shift in light water reactor pressure vessel steels, 9:2231 (J;US)
**Welding**
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1983-September 30, 1983, 9:2674 (R;US)
**STELLAR ATMOSPHERES**
*Excludes SOLAR ATMOSPHERE.*
**Gravity Waves**
Numerical simulations of convectively excited gravity waves, 9:3451 (R;US)
**Photon Transport**
Time-dependent scattering in resonance lines, 9:3968 (J;US)
**Plasma**
Paradigm transition in cosmic plasma physics, 9:3468 (R;SE)
**STELLAR RADIATION**
**Origin**
The origin of the galactic annihilation radiation, 9:3464 (R;US)
**STELLARATORS**
*See also JIPPT-2 DEVICE*
*TORSATRON STELLARATOR*
**Ballooning Instability**
Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies, 9:4134 (BA;XA)
**Charged-Particle Transport**
Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies, 9:4134 (BA;XA)
**Comparative Evaluations**
Modular stellarator reactor: a fusion power plant, 9:4178 (R;US)
**Design**
Modular stellarator reactor: a fusion power plant, 9:4178 (R;US)
**Equilibrium Plasma**
Plasma effects on Heliac configurations: a preliminary investigation, 9:4071 (R;US)
Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies, 9:4134 (BA;XA)
**Magnetic Field Configurations**
Elimination of stochasticity in stellarators, 9:4151 (R;US)
**Magnetic Fields**
Helical axis stellarators with noninterlocking planar coils, 9:4194 (J;US)
**Plasma Confinement**
Helical axis stellarators with noninterlocking planar coils, 9:4194 (J;US)
**Plasma Instability**
Application of the stellarator expansion for plasma stability studies in stellarators, 9:4106 (J;US)
Plasma effects on Heliac configurations: a preliminary investigation, 9:4071 (R;US)
**Shear**
Stellarator, hybrid stellarator, torsatron and low-shear stellarator studies, 9:4134 (BA;XA)
**Specifications**
UWTOR-M, a stellarator power reactor utilizing modular coils, 9:4219 (BA;XA)
**Stochastic Processes**
Elimination of stochasticity in stellarators, 9:4151 (R;US)
**Transport Theory**
Plasma effects on Heliac configurations: a preliminary investigation, 9:4071 (R;US)
**STEROIDS**
**Electron Transfer**
Rapid long range intramolecular electron transfer within a steroid molecule with two electron binding groups, 9:3028 (J;US)
**STIMULATED EMISSION DEVICES**
*See LASERS*
**STIRLING CYCLE**
**Kinetic Equations**
A study of dynamic energy equations for Stirling cycle analysis. Final Report, 9:2667 (R;US)
**Partial Differential Equations**
A study of dynamic energy equations for Stirling cycle analysis. Final Report, 9:2667 (R;US)

**STIRLING ENGINES**
**Marketing Research**
Stirling engine application study, 9:2665 (R;US)
**Performance Testing**
Testing and performance characteristics of a 1-kW free piston Stirling engine, 9:2666 (R;US)
**Uses**
Stirling engine application study, 9:2665 (R;US)
**Working Fluids**
Stirling engines with controlled evaporation of a two-phase two-component working fluid, 9:2664 (R;US)
**STORAGE BATTERIES**
*See ELECTRIC BATTERIES*
**STORAGE BATTERIES (LEAD-ACID)**
*See LEAD-ACID BATTERIES*
**STORAGE FACILITIES**
**Design**
Installation of a submerged storage facility by means of a multi-articulation column, 9:1866 (BA;GB)
Underwater storage tank system: a new conception for the storage of oil and methanol, 9:1864 (BA;GB)
**Environmental Impacts**
Red Lake Salt Cavern gas storage project, Mohave County, Arizona, 9:1900 (J;US)
**STORAGE RINGS**
*See also SPEAR*
**Electron Beams**
Simulation of electron spin depolarisation with the computer code SITROS, 9:3131 (R;DE)
**Muon Beams**
Muon storage ring for LAMPF II, 9:3161 (RA;US)
**STORAGE (SPENT FUEL)**
*See SPENT FUEL STORAGE*
**STORES**
*See COMMERCIAL BUILDINGS*
**STOVER**
*See AGRICULTURAL WASTES*
**STRATEGIC PETROLEUM RESERVE**
**Evaluation**
Baseline assessment of the Strategic Petroleum Reserve Project Management Office, 9:1863 (R;US)
**Management**
Baseline assessment of the Strategic Petroleum Reserve Project Management Office, 9:1863 (R;US)
**STRATOSPHERE**
**Volcanic Gases**
Stratospheric sulfate from El Chichon and the Mystery Volcano, 9:3269 (J;US)
**STRAW**
**Comparative Evaluations**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Cost**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**STREAK PHOTOGRAPHY**
**Camera Tubes**
Streak cameras for soft x-ray and optical radiation, 9:4078 (R;US)
**STRENGTH (TENSILE)**
*See TENSILE PROPERTIES*
**STRESS CORROSION**
**Mathematical Models**
An evaluation of current models for the propagation of stress-corrosion cracks, 9:2767 (J;US)
**STRING MODELS**
*Treating the interactions of extended particles through breaking and connection of strings.*
**Gauge Invariance**
Some new results in classical theory of relativistic string, 9:3753 (R;SU)
**Potentials**
Comment on "quark confinement and the Dirac equation", 9:3841 (J;US)
**STRONG INTERACTIONS**
**Color Model**
Eight-fold way to colour geometrodynamics, 9:3791 (R;XA)
**STRONTIUM**
**Adsorption**
Batch method of measuring sorption ratios, 9:3287 (R;US)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Neutron Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**Proton Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**Radiation Transport**
Time-dependent study of radiation trapping by time-delayed two-photon absorption, 9:3538 (R;US)
**STRONTIUM 90**
**Radioecological Concentration**
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)
**STRONTIUM 99**
**Rotational States**
Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A ~ 100 region, 9:3912 (J;US)
**STRONTIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**S States**
Revised $3p^6 3d^8\ {}^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3560 (J;US)
**STRONTIUM ISOTOPES**
*See also STRONTIUM 90*
*STRONTIUM 99*
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**STRUCTURAL MATERIALS**
*See BUILDING MATERIALS*
**STRUCTURES (BUILDINGS)**
*See BUILDINGS*
**STRUCTURES (MECHANICS)**
*See MECHANICAL STRUCTURES*
**STURM-LIOUVILLE EQUATION**
**Asymptotic Solutions**
Sturm-Liouville spectrum problem: quartic oscillator case, 9:3996 (R;FR;In French)
**STYRENE POLYMERS**
*See POLYSTYRENE*
**SUBBITUMINOUS COAL**
**Devolatilization**
Kinetics of devolatilization and rapid-rate methane formation. Final report Jan 72-Mar 78, 9:1774 (R;US)
**SUBMARINES**
**Construction**
Subproject 1: deep diving diverlockout, dry transfer and rescue submersible family, 9:1844 (BA;GB)
**Design**
Subproject 1: deep diving diverlockout, dry transfer and rescue submersible family, 9:1844 (BA;GB)
Subproject 2: an autonomous, manned, submersible catamaran equipment carrier - the Bruker Subcat, 9:1845 (BA;GB)
**SUBSTRATES**
**Reflection**
Optical properties of quasi-two-dimensional systems, 9:2820 (RA;BR;In Spanish)
**SUBSURFACE STRUCTURES**
**Testing**
Tests and analyses of 1/4-scale upgraded nine-bay reinforced concrete basement models, 9:3057 (RA;US)
**SUBURBS**
*See URBAN AREAS*

**SUGARS**
*See SACCHARIDES*
**SULFATES**
*See also ZINC SULFATES*
**Aerosols**
Interconversion of pollutants from the gaseous to the condensed phase. Technical progress report - brief summary of recent findings, March 1, 1983-August 31, 1983, 9:3258 (R;US)
**Atmospheric Chemistry**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)
**SULFIDES**
*See also ARSENIC SULFIDES*
*CADMIUM SULFIDES*
*CARBON SULFIDES*
*COPPER SULFIDES*
*HYDROGEN SULFIDES*
*NICKEL SULFIDES*
*SAMARIUM SULFIDES*
*TANTALUM SULFIDES*
*THALLIUM SULFIDES*
*YTTRIUM SULFIDES*
**Quantitative Chemical Analysis**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983 (Thermometric enthalpy titration of trisulfide and tetrasulfide with thallous nitrate; coulometry of polythionates), 9:1785 (R;US)
**SULFONATES**
*For salts of sulfonic acids; for esters see SULFONIC ACID ESTERS.*
**Chemical Reaction Kinetics**
Reaction of nitrite ion with hydroxylamine-N-sulfonate in aqueous solution, 9:2959 (J;US)
**SULFONIC ACIDS**
**Chemical Reactions**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**SULFUR**
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3275 (R;US)
**Activation Analysis**
Euracos activation experiments: preliminary uncertainty analysis, 9:2897 (R;US)
**Biological Accumulation**
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Chemical Reaction Kinetics**
Adiabatic and diabatic reactions of $S(^1D)$ atoms with OCS: Internal state distribution of the $S_2$ products, 9:2915 (J;US)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Production**
High temperature solar-thermochemical processing-hydrogen and sulfur from hydrogen sulfide, 9:2129 (J;GB)
**Titration**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983 (Thermometric enthalpy titration of trisulfide and tetrasulfide with thallous nitrate; coulometry of polythionates), 9:1785 (R;US)
**Voltametry**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983 (Thermometric enthalpy titration of trisulfide and tetrasulfide with thallous nitrate; coulometry of polythionates), 9:1785 (R;US)
**SULFUR CARBIDES**
*See CARBON SULFIDES*
**SULFUR COMPOUNDS**
*See also CARBON OXYSULFIDE*
*SULFATES*
*SULFIDES*
**Quantitative Chemical Analysis**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983 (Thermometric enthalpy titration of trisulfide and tetrasulfide with thallous nitrate; coulometry of polythionates), 9:1785 (R;US)
**SULFUR DIOXIDE**
Summary of the 1981 EPA (Environmental Protection Agency) national performance audit program on source measurements. Final report, 9:3275 (R;US)
**Atmospheric Chemistry**
Characterization of reactants, reaction mechanisms, and reaction products leading to extreme acid rain and acid aerosol conditions in southern California. Final report May 81-May 83, 9:3266 (R;US)
**Complexes**
Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2939 (J;US)
**Ecological Concentration**
Harmonization of methods for measurements of $SO_2$. Final report, 9:3264 (R;US)
**Fluorescence**
Radiative and nonradiative relaxation dynamics of sulfur dioxide excited in the 3000 to 3300-A region. Fluorescence emission spectra and lifetimes of single rotational levels, 9:3006 (J;US)
**Health Hazards**
Respiratory effects of air pollutants, 9:3410 (R;SE;In Swedish)
**Synthesis**
Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2939 (J;US)
**SULFUR HYDRIDES**
*See HYDROGEN SULFIDES*
**SULFUR SULFIDES**
*See SULFUR*
**SULFUR TRIOXIDE**
**Decomposition**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
**SULFURIC ACID**
**Crystal Structure**
Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$, 9:2925 (J;US)
**Neutron Diffraction**
Neutron-diffraction study of polycrystalline $H_2SO_4$ and $H_2SeO_4$, 9:2925 (J;US)
**SUPERALLOYS**
*See HEAT RESISTING ALLOYS*
**SUPERCONDUCTING COILS**
**Cooling**
Design of an indirectly cooled 3-m diameter superconducting solenoid with external support cylinder for the Fermilab Collider Detector Facility, 9:3073 (J;US)
**Design**
Design of an indirectly cooled 3-m diameter superconducting solenoid with external support cylinder for the Fermilab Collider Detector Facility, 9:3073 (J;US)
Winding design study of superconducting 10 T dipoles for a synchrotron, 9:3072 (J;US)

**SUPERCONDUCTING FILMS**
**Hot Spots**
Two-dimensional imaging of hotspots in superconducting bridges by low-temperature scanning electron microscopy, 9:3068 (J;US)
**SUPERCONDUCTING MAGNETS**
**Control Systems**
Normal phase detection in the "Tokamak-15" toroidal coil, 9:4179 (R;SU;In Russian)
**Design**
A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport, 9:3071 (J;US)
High field superconducting window-frame beam transport magnets, 9:3070 (J;US)
**Performance**
High field superconducting window-frame beam transport magnets, 9:3070 (J;US)
**Performance Testing**
A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport, 9:3071 (J;US)
**Quadrupoles**
A safe, low current, high gradient, superconducting quadrupole magnet for high energy physics beam transport, 9:3071 (J;US)
**Safety**
Superconducting magnet safety, 9:4162 (RA;XA)
**SUPERCONDUCTING WIRES**
**Critical Current**
Flux pinning in bronze-processed $Nb_3Sn$ wires, 9:2762 (BA;US)
**SUPERCONDUCTIVITY**
**Symmetry Breaking**
Spontaneous symmetry breakdown: Analogies and differences between superconductivity, quantum chromodynamics, and quantum flavordynamics, 9:3817 (J;US)
**SUPERCONDUCTORS**
**Critical Field**
Symmetry considerations for H/sub c/2 anisotropy experiments in cubic superconductors, 9:3995 (J;US)
**Landau Liquid Helium Theory**
Microscopic model for superconductor with normal state nuclei, 9:3994 (R;SU)
**Superlattices**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**SUPERLATTICES**
**Ion Channeling**
Ion channeling studies of InGaAs/GaAs strained-layer superlattices, 9:2836 (J;US)
**Sputtering**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**SUPEROXIDE RADICALS**
$O_2$
**Production**
A convenient route to superoxide ion in aqueous solution, 9:3021 (J;US)
**SUPERSYMMETRY**
**Invariance Principles**
Pionino: an argument against massless gluino, 9:3833 (R;SU)
**SUPERVOLTAGE RADIOTHERAPY**
*See RADIOTHERAPY*
**SUPPORTS**
*See also FOUNDATIONS*
**Waste Product Utilization**
Mechanical properties of some portland cement concretes made with coal and coal waste as aggregates. Report of investigations, 9:1796 (R;US)
**SURFACE CONTAMINATION**
**Binders**
Guide to radiation fixatives, 9:3038 (R;US)
**SURFACE-ACTIVE AGENTS**
*See SURFACTANTS*
**SURFACES**
**Brillouin Effect**
Brillouin scattering theory by bending in rough surfaces, 9:3981 (RA;BR;In Portuguese)
Momentum transfer in a Brillouin surface scattering, 9:3524 (RA;BR;In Portuguese)
**Chemical Analysis**
Status report on the ASTM E-42 Committee on Surface Analysis, 9:2898 (R;US)
**Electron Spectroscopy**
System for surface multiple analysis in the IFUNAM (Mexico), 9:3089 (RA;BR;In Spanish)
**Emissivity**
Physical mechanisms responsible by the spectral properties of selective surfaces, 9:2775 (RA;BR;In Portuguese)
**Ion Spectroscopy**
System for surface multiple analysis in the IFUNAM (Mexico), 9:3089 (RA;BR;In Spanish)
**Meetings**
Proceedings of the 1. Latin-American Colloquium of Surface Physics, 9:3978 (R;BR;In Portuguese)
**Physical Properties**
Proceedings of the 1. Latin-American Colloquium of Surface Physics, 9:3978 (R;BR;In Portuguese)
System for surface multiple analysis in the IFUNAM (Mexico), 9:3089 (RA;BR;In Spanish)
**Polarizability**
Polarizability of a metallic surface, 9:3515 (RA;BR;In Spanish)
**Raman Effect**
Theory of surface enhanced Raman scattering, 9:3583 (J;US)
**Roughness**
Physical mechanisms responsible by the spectral properties of selective surfaces, 9:2775 (RA;BR;In Portuguese)
**SURFACTANTS**
**Copolymerization**
Electron-transfer catalysis by surfactant vesicle stabilized colloidal platinum, 9:2923 (J;US)
**SUSPENSIONS**
**Light Scattering**
Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3599 (J;US)
**Structure Factors**
Liquid structure under shear: Comparison between computer simulations and colloidal suspensions, 9:3599 (J;US)
**SUSPENSIONS (FUEL)**
*See FUEL SLURRIES*
**SWEDEN**
**Fossil-Fuel Power Plants**
Peat-fired electric power plants, 9:1810 (R;SE;In Swedish)
**Geological Surveys**
Energigeologi - exempel pa verksamhet inom energisektorn vid sgu (energy geology - examples of activity in the energy sector within the Swedish geological survey), 9:3430 (R;US)
**Radioactive Waste Disposal**
Environmental effect of the barriers in the KBS disposal system, 9:2043 (RA;CA)
**Research Programs**
Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks, 9:2543 (R;SE;In Swedish)
**Transportation Sector**
Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks, 9:2543 (R;SE;In Swedish)
**SWITCHING CIRCUITS**
**Design**
Control system for a wound-rotor motor, 9:2192 (P;US)
**SWITZERLAND**
**BWR Type Reactors**
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
**Energy Analysis**
Switzerland - energy situation 1981, 9:2552 (R;DE;In German)
**Energy Policy**
Switzerland - energy situation 1981, 9:2552 (R;DE;In German)
**Petroleum Industry**
Switzerland and mineral oil 1981-1982, 9:2559 (R;CH;In German)
**Power Generation**
Switzerland - energy situation 1981, 9:2552 (R;DE;In German)

**PWR Type Reactors**
Operating experience with light-water reactors in Switzerland, 9:2308 (J;US)
**SYNCHROTRON RADIATION**
**Feasibility Studies**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**SYNROC PROCESS**
**Gaseous Wastes**
Study of selected off-gases produced during the immobilization of nuclear wastes in the SYNROC process. Final report for the year ended December 31, 1982, 9:2000 (R;US)
**SYNTHESIS GAS**
**Desulfurization**
Desulfurization of hot reductive gases by means of metal oxides, 9:1767 (R;DE;In German)
**Separation Processes**
Phase and volumetric studies for methane/synthesis gas separations: the hydrogen-carbon monoxide-methane system. Annual report Jan-Dec 82, 9:2078 (R;US)
**SYNTHINE PROCESS**
*See FISCHER-TROPSCH SYNTHESIS*

## T

**TANDEM ELECTROSTATIC ACCELERATORS**
*Prior to February 1979, information was indexed to Van de Graaff Accelerators.*
**Shielding**
Background analysis on a detector shield system for fast neutron scattering experiments, 9:3143 (R;JP;In Japanese)
**TANDEM MIRROR DEVICES**
*See TMR REACTORS*
*TMX DEVICES*
**TANDEM MIRROR TYPE REACTORS**
*See TMR REACTORS*
**TANDEM MIRRORS**
*Prior to September 1983 this concept was indexed to TMX DEVICES.*
*See also TMX DEVICES*
**Charged-Particle Transport**
Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4040 (R;US)
**Fusion Yield**
Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4040 (R;US)
**ICR Heating**
Monte Carlo studies of tandem-mirror plasmas interacting with waves in the ion-cyclotron range of frequencies (ICRF). Annual report, October 1, 1982-September 30, 1983, 9:4042 (R;US)
**Trapped-Particle Instability**
Curvature-driven trapped-particle modes in tandem mirrors, 9:4129 (BA;XA)
**TANK FARMS**
*See STORAGE FACILITIES*
**TANKS**
**Configuration**
Calculational results compared to benchmark critical experiments on annular tanks, 9:2035 (J;US)
**Criticality**
Calculational results compared to benchmark critical experiments on annular tanks, 9:2035 (J;US)
**Design**
Installation of a submerged storage facility by means of a multi-articulation column, 9:1866 (BA;GB)
Underwater storage tank system: a new conception for the storage of oil and methanol, 9:1864 (BA;GB)
Underwater oil storage tank for 300 MWd, 9:1865 (BA;GB)
**Installation**
Installation of a submerged storage facility by means of a multi-articulation column, 9:1866 (BA;GB)
Underwater oil storage tank for 300 MWd, 9:1865 (BA;GB)
**Testing**
Underwater oil storage tank for 300 MWd, 9:1865 (BA;GB)
**TANTALUM**
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Dehydridation**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Hydridation**
The kinetics of hydrogen absorption-desorption by metals, 9:2069 (BA;US)
**Physical Radiation Effects**
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4165 (RA;JP;In Japanese)
**Sputtering**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**Superlattices**
Artifically layered superconductors. Annual progress report, 9:2677 (R;US)
**TANTALUM ALLOYS**
**Electron Diffraction**
Determination of symmetry changes in ordered alloys by convergent beam electron diffraction (Ni-Al-Ta; Ni-Al-Mo), 9:2748 (BA;US)
**TANTALUM CARBIDES**
**Chemical Vapor Deposition**
Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2806 (BA;US)
**TANTALUM HYDRIDES**
**Electronic Structure**
Electronic structure of metal hydrides. VI. Photoemission studies and band theory of VH, NbH, and TaH, 9:2785 (J;US)
**TANTALUM OXIDES**
**Deposition**
Influence of deposition parameters on laser-damage threshold of silica-tantala AR coatings, 9:2789 (J;US)
**TANTALUM SELENIDES**
**Physical Radiation Effects**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves (Electron irradiation), 9:2815 (R;FR;In French)
**TANTALUM SULFIDES**
**Physical Radiation Effects**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves (Electron irradiation), 9:2815 (R;FR;In French)
**TARGET CHAMBERS**
**Shielding**
Background analysis on a detector shield system for fast neutron scattering experiments, 9:3143 (R;JP;In Japanese)
**TARGETS**
*See also ALUMINIUM 27 TARGET*
*AMERICIUM 242 TARGET*
*BERYLLIUM 9 TARGET*
*BISMUTH 209 TARGET*
*CALCIUM 40 TARGET*
*CALCIUM 48 TARGET*
*CARBON 12 TARGET*
*CARBON 13 TARGET*
*CERIUM 140 TARGET*
*CHLORINE 35 TARGET*
*CHLORINE 37 TARGET*
*COPPER 63 TARGET*
*DEUTERIUM TARGET*
*ELECTRON BEAM TARGETS*
*GERMANIUM 76 TARGET*
*GOLD 197 TARGET*
*HELIUM 3 TARGET*
*HOLMIUM 165 TARGET*
*HYDROGEN 1 TARGET*
*IRON 54 TARGET*
*IRON 56 TARGET*
*IRON 57 TARGET*
*LASER TARGETS*
*LEAD 206 TARGET*
*LEAD 208 TARGET*
*LITHIUM 7 TARGET*
*MAGNESIUM 25 TARGET*

*MERCURY 202 TARGET*
*NEON 20 TARGET*
*NICKEL 58 TARGET*
*NICKEL 60 TARGET*
*NICKEL 62 TARGET*
*NICKEL 64 TARGET*
*NITROGEN 14 TARGET*
*NITROGEN 15 TARGET*
*OXYGEN 16 TARGET*
*OXYGEN 18 TARGET*
*PLATINUM 192 TARGET*
*PLATINUM 194 TARGET*
*PLUTONIUM 242 TARGET*
*SILICON 28 TARGET*
*TIN 118 TARGET*
*TIN 120 TARGET*
*TRITIUM TARGET*
*URANIUM 235 TARGET*
*URANIUM 238 TARGET*
*XENON 131 TARGET*
*ZINC 64 TARGET*
*ZINC 70 TARGET*
*ZIRCONIUM 90 TARGET*

**Fabrication**
Preparation and characterization of heavy ion targets, 9:3159 (J;US)
Some methods and problems associated with making thick (1 mg/cm$^2$) $^{28}$ $^{29}$ $^{30}$silicon targets, 9:3142 (R;US)

**Materials Testing**
Bremsstrahlung converter debris shields: test and analysis, 9:3151 (R;US)

**Stresses**
Bremsstrahlung converter debris shields: test and analysis, 9:3151 (R;US)

**TAU LEPTONS**
*See TAU PARTICLES*

**TAU NEUTRINOS**

**Mass**
Tau lepton in 1980, 9:3759 (RA;SU;In Russian)

**Oscillations**
Search for neutrino oscillations: present experimental data and future experiments, 9:3625 (RA;SU)

**TAU PARTICLES**

**Lifetime**
Tau lepton in 1980, 9:3759 (RA;SU;In Russian)

**Mass**
Tau lepton in 1980, 9:3759 (RA;SU;In Russian)

**Weak Particle Decay**
Precise measurement of the tau lifetime, 9:3718 (J;US)

**TAUONS**
*See TAU PARTICLES*

**TECHNETIUM**

**Solvent Extraction**
Basic science and technology, 9:1928 (RA;US)

**TECHNETIUM COMPLEXES**

**Chemical Preparation**
Synthesis and characterization of hexakis(alkyl isocyanide) and hexakis(aryl isocyanide) complexes of technetium(I), 9:3039 (J;US)

**Structural Chemical Analysis**
Synthesis and characterization of hexakis(alkyl isocyanide) and hexakis(aryl isocyanide) complexes of technetium(I), 9:3039 (J;US)

**TECHNETIUM ISOTOPES**

**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)

**TECHNICAL WRITING**
Clarity in writing and editing, 9:4233 (R;US)

**TECHNOLOGY TRANSFER**

**International Agreements**
The U.S. DOE commercial waste disposal programs, 9:2037 (J;US)

**International Cooperation**
Radiation protection technology transfer for overseas nuclear power stations, 9:2468 (J;US)

**TEETH**

**Biomedical Radiography**
Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3374 (R;DE;In German)

**Calcium**
Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3374 (R;DE;In German)

**Microradiography**
Application of different qualities of X-rays by X-ray microradiography to increase the detection efficiency of calcium, 9:3374 (R;DE;In German)

**TEM (MICROSCOPY)**
*See TRANSMISSION ELECTRON MICROSCOPY*

**TEMPERATURE (0065-0273 K)**
*See LOW TEMPERATURE*

**TENNESSEE VALLEY REGION**

**Water Resources**
Tennessee Valley water resources: a strategy for the 1980s and beyond, 9:2540 (R;US)

**TENSILE PROPERTIES**
*See also ELASTICITY*

**Mathematical Models**
Optimization technique applied to interpretation of experimental data and research of constitutive laws, 9:2679 (R;XE)

**TENSILE STRENGTH**
*See TENSILE PROPERTIES*

**TERBIUM 153**

**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)

**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)

**TERRESTRIAL BACKGROUND**
*See BACKGROUND RADIATION*

**TERTIARY RECOVERY**
*See ENHANCED RECOVERY*

**TESTES**

**Radionuclide Kinetics**
Tissue, cellular, and subcellular distribution of $^{241}$Pu in the rat testes, 9:3395 (J;US)

**TETRACHLOROMETHANE**
*See CARBON TETRACHLORIDE*

**TETRACYCLINES**

**Radioimmunoassay**
Development of a radioimmunoassay of tetracycline and its derivatives, 9:3354 (R;DE;In German)

**TETRAFLUOROMETHANE**
*See CARBON TETRAFLUORIDE*

**TETRAHYDRONAPHTHALENE**
*See TETRALIN*

**TETRALIN**

**Solvent Properties**
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, October 15, 1982-January 15, 1983, 9:1764 (R;US)
Cooperative investigation by Auburn University and Cities Service Research and Development Company of combined coal and heavy resid processing. Quarterly report, April 15, 1983-July 15, 1983, 9:1765 (R;US)
Dissolution of coal in solvents, 9:1777 (D;US)

**TETRAMETHYLTETRASELENAFULVALENE**
*See TMTSF*

**TEVATRON**

**Quadrupoles**
Fermilab tevatron quadrupoles, 9:3123 (J;US)

**TEXAS**

**Petroleum Deposits**
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1814 (R;US)

**Stratigraphy**
Genesis and emplacement of oil in the San Andres Formation, Northern Shelf of the Midland Basin, Texas. Report of Investigations No. 116, 9:1814 (R;US)

**TEXTOR TOKAMAK**

**Electric Grounds**
Grounding system of TEXTOR, 9:4228 (BA;GB)

**Power Supplies**
Interactions between the line-connected static convertors of TEXTOR, 9:4227 (BA;GB)
**TFR TOKAMAK**
**ECR Heating**
Computation code for the energy deposition calculation of a resonant wave near the electron cyclotron frequency, 9:4049 (R;FR;In French)
**TFTR REACTORS**
**Construction**
Status of TFTR construction and proposed research plan, 9:4202 (BA;XA)
**Planning**
Status of TFTR construction and proposed research plan, 9:4202 (BA;XA)
**Tearing Instability**
Thermal consequences of plasma disruptions in TFTR and ETF, 9:4140 (BA;GB)
**THALLIUM ISOTOPES**
**Beta Decay**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)
**Energy Levels**
Nuclear structure from radioactive decay. Annual progress report, 9:3916 (R;US)
**THALLIUM NITRATES**
**Chemical Reactions**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)
**THALLIUM SULFIDES**
**Phase Transformations**
Soft acoustic mode in thallium arsenic sulphide $Tl_3AsS_4$, 9:2873 (J;GB)
**THE GEYSERS**
*See GEYSERS GEOTHERMAL FIELD*
**THERMAL BARRIERS**
**Performance**
Control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 9:4192 (R;US)
**THERMAL CONDUCTIVITY**
**Measuring Instruments**
Improvement in the design and extension of operating range of viscometers and thermal conductivity cells. Annual technical progress report, 9:3203 (R;US)
**Measuring Methods**
Automated 2-D thermal model to predict temperatures in the material stack of a thermal comparator test device, 9:3095 (R;US)
**Regulations**
Thermal insulation ordinance and utilization of solar energy, 9:2595 (RA;DE;In German)
**THERMAL DECOMPOSITION**
*See PYROLYSIS*
**THERMAL EFFLUENTS**
**Biological Effects**
Impact of thermal loading and other water quality parameters on the epizootiology of Aeromonas hydrophila infections of centrarchids. Final report, 9:3402 (R;US)
**THERMAL ENERGY STORAGE EQUIPMENT**
**Specifications**
Molten salt thermal energy storage subsystem for solar thermal central receiver plants, 9:2146 (R;US)
**THERMAL INSULATION**
**Regulations**
Thermal insulation ordinance and utilization of solar energy, 9:2595 (RA;DE;In German)
**Thermal Conductivity**
Automated 2-D thermal model to predict temperatures in the material stack of a thermal comparator test device, 9:3095 (R;US)
**THERMAL PHOTOGRAPHY**
*See INFRARED THERMOGRAPHY*
**THERMAL POLLUTION (AIR)**
*See AIR POLLUTION*
**THERMAL PROPERTIES**
*See THERMODYNAMIC PROPERTIES*
**THERMAL SPRINGS**
**Seeps**
Geothermal remnant activity at Ngawha 1981, 9:2151 (R;NZ)
**THERMAL STORAGE**
*See HEAT STORAGE*
**THERMAL WATERS**
**Geothermometry**
Stable isotopic investigation of the ground water quality and transport systems in the Safford Valley, Arizona. Report for Oct 80-Sep 81, 9:2154 (R;US)
**THERMOCHEMICAL PROCESSES**
*See also COMBUSTION*
*PYROLYSIS*
Use of oxides in thermochemical water-splitting cycles for solar heat sources: copper oxides, 9:2109 (R;US)
**THERMODYNAMIC ACTIVITY**
*Used instead of molar fractions in non-ideal solutions.*
**Mathematical Models**
Use of Pitzer's equations to estimate strong-electrolyte activity coefficients in aqueous flue gas desulfurization processes, 9:2968 (J;US)
**THERMODYNAMIC PROPERTIES**
*See also THERMAL CONDUCTIVITY*
*VAPOR PRESSURE*
**Computerized Simulation**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**Mathematical Models**
Development of a reference data system for the liquefaction-technology data base. Technical progress report, 1 April 1983-3 August 1983, 9:1761 (R;US)
**THERMODYNAMICS**
**Irreversible Processes**
Thermodynamic length and dissipated availability, 9:4023 (J;US)
**THERMOLUMINESCENT DOSEMETERS**
**Design**
Use of wrist albedo neutron dosimeters, 9:3195 (R;US)
**Performance Testing**
Use of wrist albedo neutron dosimeters, 9:3195 (R;US)
**THERMONUCLEAR FUELS**
**Burnup**
p-$^{11}$B multipole evaluation, 9:2061 (BA;XA)
**THERMONUCLEAR POWER PLANTS**
**Design**
ELMO Bumpy Torus fusion reactor design study, 9:4204 (BA;XA)
Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant, 9:4203 (BA;XA)
Westinghouse ICF power plant design, 9:4208 (BA;XA)
**Economic Analysis**
Methods of economic analysis applied to fusion research. Final report, 9:4149 (R;US)
**Process Heat**
Preconceptual design of hyfire. A fusion driven high temperature electrolysis plant, 9:4203 (BA;XA)
**THERMONUCLEAR REACTIONS**
Alternate fusion-fuel-cycle plasma physics and reaction kinetics. Final report, 9:4148 (R;US)
**THERMONUCLEAR REACTOR MATERIALS**
**Crack Propagation**
Miniature center-cracked-tension specimen for fatigue crack growth testing, 9:2684 (R;US)
**Erosion**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**Fatigue**
Miniature center-cracked-tension specimen for fatigue crack growth testing, 9:2684 (R;US)
**Materials Testing**
Miniature center-cracked-tension specimen for fatigue crack growth testing, 9:2684 (R;US)
**Performance**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)

**Radioactivation**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)
Low activation fusion reactor design, 9:4211 (BA;XA)
Potential low-level waste disposal limits for fusion radionuclides, 9:2060 (R;US)
**Sputtering**
Critical plasma-materials issues for fusion reactor designs, 9:4217 (BA;XA)
**Technology Assessment**
Fusion materials. Adapting to realistic reactor environments, 9:4216 (BA;XA)

**THERMONUCLEAR REACTORS**
*For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.*
*See also D-T REACTORS*
*I-BEAM TYPE REACTORS*
*LASER FUSION REACTORS*
*PULSED FUSION REACTORS*
*TOKAMAK TYPE REACTORS*
**Breeding Blankets**
First wall and blanket engineering development for magnetic fusion reactors, 9:4213 (BA;XA)
**Design**
Fusion reactor design-III. Report on the third IAEA technical committee meeting and workshop, Tokyo, Japan, 5-16 October 1981, 9:4199 (BA;XA)
**First Wall**
Cyclic thermal stresses in fusion reactors, 9:4215 (BA;XA)
First wall and blanket engineering development for magnetic fusion reactors, 9:4213 (BA;XA)
Progress in engineering simulation testing of fusion reactor first wall components, 9:4214 (BA;XA)
**Fuel Cycle**
Advanced fuel concepts and applications, 9:4212 (BA;XA)
**International Cooperation**
Fusion reactor design-III. Report on the third IAEA technical committee meeting and workshop, Tokyo, Japan, 5-16 October 1981, 9:4199 (BA;XA)
**Magnet Coils**
Near-term tokamak reactor designs with high performance resistive magnets, 9:4201 (BA;XA)
**Maintenance**
Issues in radioactivity for fusion energy: remote maintenance rating, 9:4191 (R;US)
**National Energy Plan**
Status of DOE's implementation of the Magnetic Fusion Energy Engineering Act of 1980, 9:4153 (R;US)
**Radioactive Waste Disposal**
Potential low-level waste disposal limits for fusion radionuclides, 9:2060 (R;US)
**Reactor Safety**
Fusion safety and protection issues: Lessons from fast breeder reactors and reprocessing plant studies, 9:4163 (RA;XA)
Past IAEA activities in the area of fusion safety. A brief overview, 9:4158 (RA;XA)
Safety methodology and risk targets, 9:4161 (RA;XA)
**Reverse-Field Pinch**
Recent studies of reversed-field pinch reactors, 9:4206 (BA;XA)
**Superconducting Magnets**
Superconducting magnet safety, 9:4162 (RA;XA)

**THERMONUCLEAR WEAPONS**
*See NUCLEAR WEAPONS*

**THIN FILMS**
**Fabrication**
Integrated thin film solar cell generators with higher output voltages, 9:2103 (R;XE)
**Growth**
Characterization of the substrate surface, nucleation and initial growth in the thin film formation, 9:3512 (RA;BR;In Portuguese)
**Nonlinear Problems**
Nonlinear saturation of Rayleigh—Taylor instability in thin films, 9:3985 (J;US)
**Nucleation**
Characterization of the substrate surface, nucleation and initial growth in the thin film formation, 9:3512 (RA;BR;In Portuguese)
**Rayleigh-Taylor Instability**
Nonlinear saturation of Rayleigh—Taylor instability in thin films, 9:3985 (J;US)
**Surface Properties**
Characterization of the substrate surface, nucleation and initial growth in the thin film formation, 9:3512 (RA;BR;In Portuguese)
**X-Ray Emission Analysis**
Surface studies with muons, 9:2890 (RA;US)

**THIO COMPOUNDS**
*See ORGANIC SULFUR COMPOUNDS*

**THIOETHERS**
*See SULFIDES*

**THORIUM**
**Radionuclide Migration**
The relative mobility of natural (Th, Pb and Po) and fallout (Pu, Am, Cs) radionuclides in the coastal marine environment: results from model ecosystems (MERL) and Narragansett Bay, 9:3334 (J;GB)

**THORIUM 228**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**THORIUM 229**
**Alpha Decay**
Comment on "Determination of gamma-ray energies and abundances of $^{229}$Th", 9:3934 (J;US)

**THORIUM 230**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Excretion**
Levels of $^{234}$U, $^{238}$U and $^{230}$Th in excreta of uranium mill crushermen, 9:3391 (J;GB)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**THORIUM CYCLE**
**Economics**
Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program), 9:2280 (R;US)
**Isotope Ratio**
Comparison of two thorium fuel cycles for use in light water prebreeder/breeder reactor systems (AWBA Development Program), 9:2280 (R;US)

**THORIUM ORES**
**Prospecting**
Uranium and thorium reserves of the world. Prospecting, mining, and costs, 9:1907 (B;DE;In German)

**THORIUM OXIDES**
**Catalytic Effects**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Deactivation**
Studies of poisoned catalysts by means of Auger electron spectroscopy and x-ray photoelectron spectroscopy (Catalytic gas detectors), 9:1899 (BA;GB)
**Enthalpy**
Thermophysical properties of reactor fuels, 9:1926 (BA;US)
**Sorptive Properties**
Chemisorption of CO and $CO_2$ on gold-supported $ThO_2$ films, 9:2784 (J;US)

**THORIUM RESERVES**
**Global Aspects**
Uranium and thorium reserves of the world. Prospecting, mining, and costs, 9:1907 (B;DE;In German)

**THORIUM-HOCHTEMPERATUR PROTOTYPE REACTOR**
*See THTR-300 REACTOR*

**THREE MILE ISLAND-1 REACTOR**
**Lawsuits**
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289), 9:2304 (R;US)
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289). Volume 2. Appendices, 9:2305 (R;US)
**Reactor Licensing**
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289), 9:2304 (R;US)

**THREE MILE ISLAND-2 REACTOR**
**Decontamination**
Chemical Technology Division progress report for the period April 1, 1981-March 31, 1983 (Oak Ridge National Laboratory), 9:4237 (R;US)
Three Mile Island support studies, 9:2441 (RA;US)
**Legal Aspects**
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289), 9:2304 (R;US)
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289). Volume 2. Appendices, 9:2305 (R;US)
**Radioactivity Transport**
Development of preliminary radionuclide mass balance for the TMI-2 accident, 9:2457 (J;US)
**Reactor Accidents**
Development of preliminary radionuclide mass balance for the TMI-2 accident, 9:2457 (J;US)
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289), 9:2304 (R;US)
GPU v. B and W lawsuit review and its effect on TMI-1 (Docket 50-289). Volume 2. Appendices, 9:2305 (R;US)
Identification of fuel debris in TMI-2 systems by gamma-ray spectroscopy, 9:2458 (J;US)
Three Mile Island 2. The accident of March 28, 1979, as seen from the point of view of radiation protection experts, 9:2428 (R;DE;In German)
Three Mile Island support studies, 9:2441 (RA;US)

**THTR-300 REACTOR**
**Planning**
HKG business report 1981, 9:2243 (R;DE;In German)

**THULIUM 153**
**Energy Levels**
Nuclear data sheets for A = 153, 9:3918 (J;US)
**Energy-Level Transitions**
Nuclear data sheets for A = 153, 9:3918 (J;US)

**THULIUM SELENIDES**
**Electron Spectroscopy**
Electron tunneling spectroscopy of intermediate valence materials, 9:2747 (BA;NL)
**Phonons**
Lattice dynamics of the intermediate valence compounds Sm/sub 0.75/Y/sub 0.25/S and TmSe, 9:2871 (BA;NL)

**THYRATRONS**
**Trigger Circuits**
Inexpensive solid-state trigger unit for thyratrons, 9:3102 (R;US)

**THYROID**
**Positron Computed Tomography**
In vivo imaging of the human thyroid with the Rutherford Positron Camera using (124)L, 9:3377 (R;US)
**Radionuclide Kinetics**
Review of three incidents involving the release of $^{125}I$ from seeds interstitially implanted within the prostate gland, 9:3390 (J;GB)

**TIGHT SANDS**
*See PERMEABILITY*
*SANDSTONES*

**TIME PROJECTION CHAMBERS**
*See PROJECTION SPARK CHAMBERS*

**TIN**
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Compton Effect**
Compton scattering at bound electrons of copper, lead and tin at the primary photon energy Esub(y1)=661,66 keV and the scattering angle THETA=145°, 9:2700 (R;DE;In German)
**Diffusion**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
Diffusion assisted by radiation as a surface protection method, 9:2694 (RA;BR;In Portuguese)
**Ecological Concentration**
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**Electron Diffraction**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Electronic Structure**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**Ion Implantation**
Modification of the iron mechanical- and corrosion features by ion implantation in surface, 9:2691 (RA;BR;In Portuguese)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxidation**
Modification of the iron mechanical- and corrosion features by ion implantation in surface, 9:2691 (RA;BR;In Portuguese)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Photoelectron Spectroscopy**
Characterization of thin $Nb_3Sn$ diffusion layers on Nb(110): Low-energy electron-diffraction and photoemission studies, 9:2716 (J;US)
**X-Ray Fluorescence Analysis**
Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2891 (R;ZA)

**TIN 118**
**Giant Resonance**
Excitation of the isoscalar giant quadrupole resonance in $^{118}Sn(\pi^{+-},\pi^{+-\prime})$, 9:3911 (J;US)

**TIN 118 TARGET**
**Pion Minus Reactions**
Excitation of the isoscalar giant quadrupole resonance in $^{118}Sn(\pi^{+-},\pi^{+-\prime})$, 9:3911 (J;US)
**Pion Plus Reactions**
Excitation of the isoscalar giant quadrupole resonance in $^{118}Sn(\pi^{+-},\pi^{+-\prime})$, 9:3911 (J;US)

**TIN 120 TARGET**
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)

**TIN ALLOYS**
*See also ZIRCALOY*
**Magnetic Fields**
Flux pinning in bronze-processed $Nb_3Sn$ wires, 9:2762 (BA;US)
**Superconductivity**
Flux pinning in bronze-processed $Nb_3Sn$ wires, 9:2762 (BA;US)

**TIN COMPLEXES**
**Photochemical Reactions**
Photoreactions and photoelectrochemical effects in supported multilayer assemblies. Mechanisms of interfacial reactions involving reactive supports, metalloporphyrin surface films, and solutions, 9:3022 (J;US)

**TIN ORES**
**Chemical Analysis**
Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2891 (R;ZA)

**TIRES**
**Energy Losses**
Viscoelastic loss characteristics of cord rubber composites, 9:2802 (R;US)
**TISSUES**
**Radioactivation**
Activation of the major constituents of tissue and air by a fast neutron radiation therapy beam, 9:3976 (J;US)
**TITANIUM**
**Carbon 12 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Electron Spin Resonance**
Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Electronic Structure**
Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Iron 56 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 16 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Oxygen 18 Reactions**
Factorization of fragment-production cross sections in relativistic heavy-ion collisions, 9:3877 (J;US)
**Physical Radiation Effects**
Trapping and re-emission of energetic hydrogen and helium ions in materials, 9:4165 (RA;JP;In Japanese)
**Sorptive Properties**
Molecular orbital study of $O_2^-$ adsorbed on titanium ions on oxide supports, 9:2932 (J;US)
**Vapor Deposited Coatings**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**TITANIUM 44**
**Beta-Plus Decay**
Half-life of $^{44}Ti$, 9:3887 (J;US)
**TITANIUM ALLOYS**
*See also ALLOY-A-286*
*TITANIUM BASE ALLOYS*
**Critical Field**
Critical-field measurements in Nb-Ti compositon-modulated alloys, 9:2740 (J;US)
**Ferromagnetism**
Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/, 9:2758 (J;GB)
**Oxidation**
Microstructure of vanadium-oxygen alloys, 9:2796 (BA;US)
**Transition Temperature**
Critical-field measurements in Nb-Ti compositon-modulated alloys, 9:2740 (J;US)
**TITANIUM BASE ALLOYS**
**Phase Studies**
Example of the use of combined techniques of analytical transmission electron microscopy for phase identification (Ti-8Al-4Y), 9:2749 (BA;US)
**TITANIUM BORIDES**
**Chemical Vapor Deposition**
Chemical vapor deposition fabrication of filament-reinforced composites for high temperature applications, 9:2806 (BA;US)
**Phase Studies**
Phase identification in $TiB_2Ni$ composites by analytical electron microscopy, 9:2797 (BA;US)
**TITANIUM COMPLEXES**
**Catalytic Effects**
Desulfurization with transition metal catalysts, 9:1758 (R;US)
**TITANIUM OXIDES**
**Auger Electron Spectroscopy**
Analysis by SIMS and AES of H:$TiO_2$ electrodes, 9:2887 (RA;BR;In Spanish)
**Chemical Vapor Deposition**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**Crystal Structure**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**Evaporation**
Investigation of the evaporation thermodynamics and stationary states (so-called "congruent states") in the study of oxides and their mixtures by the effusion method--application to $Al_2O_3$, CaO, and the mixtures $Al_2O_3$-CaO and $Ti_2O_3$-$TiO_2$, 9:2792 (J;US)
**Ion Microprobe Analysis**
Analysis by SIMS and AES of H:$TiO_2$ electrodes, 9:2887 (RA;BR;In Spanish)
**Mass Spectroscopy**
Analysis by SIMS and AES of H:$TiO_2$ electrodes, 9:2887 (RA;BR;In Spanish)
**Photoelectron Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**Quantity Ratio**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**Surfaces**
Structural properties of titanium dioxide films deposited in an rf glow discharge, 9:2777 (J;US)
**X-Ray Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**TLD (DOSEMETERS)**
*See THERMOLUMINESCENT DOSEMETERS*
**TLD SYSTEMS**
*See THERMOLUMINESCENT DOSEMETERS*
**TMPN**
*See ORGANIC OXYGEN COMPOUNDS*
**TMR REACTORS**
**Breeding Blankets**
Feasibility study of a fission suppressed blanket for a tandem mirror hybrid reactor, 9:4210 (BA;XA)
**Charged-Particle Transport**
Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4040 (R;US)
**Control Systems**
Fusion reactors: physics and technology. Annual progress report, 9:4147 (R;US)
**Cusped Geometries**
Designs of tandem mirror fusion reactors, 9:4207 (BA;XA)
**Fusion Yield**
Fusion-product energy and particle loss from tandem-mirror reactors by nuclear scattering, 9:4040 (R;US)
**Reactor Shutdown**
Fusion reactors: physics and technology. Annual progress report, 9:4147 (R;US)
**Reactor Start-Up**
Fusion reactors: physics and technology. Annual progress report, 9:4147 (R;US)
**Safety**
Fusion reactors: physics and technology. Annual progress report, 9:4147 (R;US)
**TMTSF**
**Anions**
Role of monovalent anions in organic superconductors, 9:2813 (J;US)
**Crystal Structure**
Role of monovalent anions in organic superconductors, 9:2813 (J;US)
**Electronic Structure**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**Fermi Level**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)

**Shubnikov-De Haas Effect**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
**Superconductivity**
Fermi-surface nesting, closed orbits, and the "threshold field" in an organic superconductor, 9:2850 (J;US)
Role of monovalent anions in organic superconductors, 9:2813 (J;US)

**TMX DEVICES**
**ECR Heating**
Potentials in thermal barriers with strong electron-cyclotron heating, 9:4093 (J;US)
**Plasma Macroinstabilities**
Ballooning modes in quadrupole tandem mirrors, 9:4105 (J;US)
**Thermal Barriers**
Control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 9:4192 (R;US)
Numerical solution of the electron distribution function in tandem-mirror thermal barriers, 9:4094 (J;US)
Potentials in thermal barriers with strong electron-cyclotron heating, 9:4093 (J;US)

**TOKAMAK DEVICES**
*See also ALCATOR DEVICE*
*JIPPT-2 DEVICE*
*PDX DEVICES*
*SPHEROMAK DEVICES*
*TEXTOR TOKAMAK*
*TFR TOKAMAK*
*TOKAPOLE DEVICES*
*TORUS-II TOKAMAK*
*TUMAN DEVICES*
**Design**
DTHR and CTHR: A review of two recent tokamak fusion-fission hybrid reactor design studies, 9:4209 (BA;XA)
**ECR Heating**
Quasilinear saturation effects on electron cyclotron wave damping of the ordinary mode in tokamak plasmas, 9:4081 (J;US)
**Electron Beam Injection**
Intense relativistic electron beam injector system for tokamak current drive, 9:4198 (J;US)
**Electron Sources**
Intense relativistic electron beam injector system for tokamak current drive, 9:4198 (J;US)
**High-Beta Plasma**
High-beta tokamak plasma physics studies, 9:4132 (BA;XA)
**High-Frequency Heating**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Hydromagnetic Waves**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Ion Temperature**
Design and construction of a $D_2O$ oscillator with optical pumping to measure the ion temperature of a plasma by Thomson scattering, 9:4051 (R;FR;In French)
**Limiters**
TRAIL - a tokamak rail gun limiter, 9:4229 (BA;GB)
**Lower Hybrid Heating**
Parametric excitation of ion-sound quasimodes during lower-hybrid heating experiments in tokamaks, 9:4104 (J;US)
**Magnet Coils**
Near-term tokamak reactor designs with high performance resistive magnets, 9:4201 (BA;XA)
**Mechanical Structures**
To the calculation of stress-strained state of the discharge chambers of tokamak devices, 9:4183 (R;SU;In Russian)
**Plasma**
Possible method for burn control by compression-decompression, 9:4063 (R;JP)
**Plasma Density**
Intense relativistic electron beam injector system for tokamak current drive, 9:4198 (J;US)
**Plasma Diagnostics**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Plasma Drift**
Reduced magnetohydrodynamics and the Hasegawa—Mima equation, 9:4091 (J;US)
**Plasma Heating**
Linear and quasilinear theory of second electron cyclotron harmonic heating of tokamak plasmas, 9:4082 (J;US)
**Plasma Macroinstabilities**
Reduced equations for internal kinks in tokamaks, 9:4114 (J;US)
**Plasma Microinstabilities**
Drift-wave turbulence with wave—wave and wave—particle nonlinear effects in a sheared slab, 9:4090 (J;US)
**Plasma Waves**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Poloidal Divertors**
Survey of fusion reactor technology. Development of design technology for the magnet system of Tokamak fusion reactor, 9:4176 (R;KR;In Korean)
**Runaway Electrons**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Shock Waves**
Wills Plasma Physics Department annual progress report 1982, 9:4056 (R;AU)
**Stress Analysis**
Calculation of the mechanical strength of the T-15 tokamak discharge chamber, 9:4182 (R;SU;In Russian)
**Superconducting Magnets**
Normal phase detection in the "Tokamak-15" toroidal coil, 9:4179 (R;SU;In Russian)
**Tearing Instability**
Tokamak disruptions, 9:4037 (R;GB)

**TOKAMAK ETF**
**Tearing Instability**
Thermal consequences of plasma disruptions in TFTR and ETF, 9:4140 (BA;GB)

**TOKAMAK FONTENAY-AUX-ROSES**
*See TFR TOKAMAK*

**TOKAMAK FUSION TEST REACTOR**
*See TFTR REACTORS*

**TOKAMAK TYPE REACTORS**
*See also DOUBLET REACTORS*
*INTOR TOKAMAK*
*ISX TOKAMAK*
*PLT DEVICES*
*STARFIRE TOKAMAK*
*TFTR REACTORS*
*TOKAMAK ETF*
**ICR Heating**
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Limiters**
Research on modeling of FED/INTOR radio-frequency heating and studies of FED/INTOR impurity-control mechanisms. Final technical report, 9:4044 (R;US)
**Thermonuclear Reactor Cooling Systems**
Liquid lithium as a coolant for Tokamak fusion reactors, 9:4144 (R;GB)

**TOKAPOLE DEVICES**
**Plasma Heating**
Plasma heating with strong poloidal Ohmic currents, 9:4084 (J;US)

**TOLUENE**
**Labelling**
Regiospecific incorporation of radioiodine into aromatic rings via organosilanes, 9:3042 (J;GB)

**TOLUIDINES**
**Biological Effects**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**Dose-Response Relationships**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)

**Mathematical Models**
Structure activity relationships: their function in biological prediction, 9:3403 (R;US)
**TOLYLAMINES**
*See TOLUIDINES*
**TOMATOES**
**Food Processing**
Method of preserving fruits and vegetables. Final report, 9:2638 (R;US)
**Preservation**
Method of preserving fruits and vegetables. Final report, 9:2638 (R;US)
**TOP ACCIDENTS**
*See TRANSIENT OVERPOWER ACCIDENTS*
**TORNADO TURBINES**
**Performance Testing**
Performance of tornado-type wind turbines with radial inflow supply, 9:2182 (R;US)
**TOROIDAL PINCH DEVICES**
**Magnetic Fields**
External magnetic field configurations for EXTRAP, 9:4187 (R;SE)
**TORSATRON STELLARATOR**
**Comparative Evaluations**
Modular stellarator reactor: a fusion power plant, 9:4178 (R;US)
**Design**
Modular stellarator reactor: a fusion power plant, 9:4178 (R;US)
**TORUS-II TOKAMAK**
*Device to be built within the EURATOM-CEA Association.*
**Plasma Macroinstabilities**
Experimental study of high-beta tokamak stability, 9:4118 (J;US)
**TOTAL-ABSORPTION SPECTROMETERS**
*See SHOWER COUNTERS*
**TOWER FOCUS POWER PLANTS**
**Latent Heat Storage**
Molten salt thermal energy storage subsystem for solar thermal central receiver plants, 9:2146 (R;US)
**TOXIC MATERIALS**
**Information Systems**
Toxicology data bank steps up efforts, 9:4258 (J;US)
**TOXICITY**
**Information Systems**
Toxicology data bank steps up efforts, 9:4258 (J;US)
**TPC**
*See PROJECTION SPARK CHAMBERS*
**TRACER TECHNIQUES**
Radioisotope applications in industry. Part 2: Practical applications, 9:3189 (R;AT;In German)
**TRACK DETECTORS (DIELECTRIC)**
*See DIELECTRIC TRACK DETECTORS*
**TRACK DETECTORS (GAS)**
*See GAS TRACK DETECTORS*
**TRACKS**
*See PARTICLE TRACKS*
**TRAINING-RESEARCH REACTOR KYOTO**
*See KUR REACTOR*
**TRANSDUCERS**
Conical transducer for generation of acoustic waves in fluids, 9:3074 (J;US)
**TRANSFER (HEAT)**
*See HEAT TRANSFER*
**TRANSFER (IN ENVIRONMENT)**
*See RADIONUCLIDE MIGRATION*
**TRANSFER (IN ORGANISM)**
*See RADIONUCLIDE KINETICS*
**TRANSFORMATIONS (ONCOGENIC)**
*See ONCOGENIC TRANSFORMATIONS*
**TRANSFORMATIONS (PHASE)**
*See PHASE TRANSFORMATIONS*
**TRANSIENT OVERPOWER ACCIDENTS**
**Computerized Simulation**
BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2456 (J;US)
**Fuel Element Failure**
Calibration and qualification of the Los Alamos failure model, 9:2462 (J;US)
**Fuel-Cladding Interactions**
Calibration and qualification of the Los Alamos failure model, 9:2462 (J;US)
**Heat Transfer**
BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2456 (J;US)
**Hydraulics**
BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2456 (J;US)
**Thermodynamics**
BWR thermohydraulics simulation on the AD-10 peripheral processor, 9:2456 (J;US)
**TRANSIENTS**
**Neutron Flux**
Dynamic flux synthesis with discontinuous trial functions, 9:2257 (RA;CA)
**Pressure Gradients**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)
**Reactor Kinetics**
Dynamic flux synthesis with discontinuous trial functions, 9:2257 (RA;CA)
**Temperature Gradients**
Computation methods and analysis on the dynamic bahavior of power plants with high temperature gas cooled reactor, 9:2246 (R;DE;In German)
**TRANSISTORS**
*See also MOS TRANSISTORS*
**Fabrication**
GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications, 9:3104 (J;US)
**Operation**
GaP/Al/sub x/Ga/sub 1-x/P heterojunction transistors for high-temperature electronic applications, 9:3104 (J;US)
**TRANSITION ELEMENT COMPOUNDS**
*See also IRIDIUM COMPOUNDS*
*IRON COMPOUNDS*
*NICKEL COMPOUNDS*
*OSMIUM COMPOUNDS*
**Mesic Atoms**
Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3531 (R;SU;In Russian)
**TRANSITION ELEMENTS**
*See also CHROMIUM*
*COBALT*
*COPPER*
*GOLD*
*IRON*
*MANGANESE*
*MOLYBDENUM*
*NICKEL*
*NIOBIUM*
*RHENIUM*
*SILVER*
*TANTALUM*
*TECHNETIUM*
*TITANIUM*
*TUNGSTEN*
*VANADIUM*
*YTTRIUM*
*ZIRCONIUM*
**Mesic Atoms**
Analysis of experimental data on mesic X-ray spectra of metals and their oxides, 9:3531 (R;SU;In Russian)
**TRANSITION METALS**
*See TRANSITION ELEMENTS*
**TRANSITIONS (ENERGY LEVEL)**
*See ENERGY-LEVEL TRANSITIONS*
**TRANSITIONS (PHASE)**
*See PHASE TRANSFORMATIONS*
**TRANSMISSION ELECTRON MICROSCOPY**
**Sample Preparation**
Preparation of ceramic particulates for transmission electron microscopy, 9:2671 (BA;US)
**Uses**
Applications of microdiffraction with a STEM instrument, 9:3218 (J;US)

**TRANSMISSION (HEAT)**
*See HEAT TRANSFER*
**TRANSMISSION LINES**
*See POWER TRANSMISSION LINES*
**TRANSMISSION TOWERS**
*See POWER TRANSMISSION TOWERS*
**TRANSPORT**
*Limited to the movement of goods and persons.*
*See also LAND TRANSPORT*
*MARITIME TRANSPORT*
**Fuel Consumption**
Energy efficiency of different modes of goods transport, 9:2633 (R;FI;In Finnish)
Energy efficiency of different modes of person transport, 9:2634 (R;FI;In Finnish)
**TRANSPORT (IN ORGANISMS)**
*See RADIONUCLIDE KINETICS*
**TRANSPORT THEORY**
*See also NEUTRON TRANSPORT THEORY*
**Meetings**
Mathematical problems in kinetic theory: Oberwolfach Conference, 22—26 November 1982, 9:3970 (J;US)
**TRANSPORTATION SECTOR**
**Energy Analysis**
Macroeconometric model to allow energy policy analysis on changing fuel, specific prices, and production capacities, 9:2531 (R;US)
Municipal energy planning for the transportation sector. The present situation and urgent R and D tasks (Sweden), 9:2543 (R;SE;In Swedish)
**TRANSPORTATION SYSTEMS**
**Energy Consumption**
Traffic impacts and energy consumption in urban areas, 9:2635 (R;FI;In Finnish)
**Traffic Control**
Traffic impacts and energy consumption in urban areas, 9:2635 (R;FI;In Finnish)
**TRANSURANIUM COMPOUNDS**
*See also NEPTUNIUM COMPOUNDS*
*PLUTONIUM COMPOUNDS*
**Magnetic Properties**
Magnetism in transuranics (invited), 9:2735 (J;US)
**TRANSURANIUM ELEMENTS**
*See also NEPTUNIUM*
*PLUTONIUM*
**Magnetic Properties**
Magnetism in transuranics (invited), 9:2735 (J;US)
**Production**
Transuranium-element processing, 9:3037 (RA;US)
**TRANSURANIUM WASTES**
*See ALPHA-BEARING WASTES*
**TRAPPED-PARTICLE INSTABILITY**
**Instability Growth Rates**
Curvature-driven trapped-particle modes in tandem mirrors, 9:4129 (BA;XA)
**TRAVELLING WAVES**
**Phase Velocity**
Analysis of current drive by travelling wave based on theory of intrinsic stochasticity, 9:4065 (R;JP)
**TREES**
**Cultivation Techniques**
Tree species and management strategies for biomass production in the Lake States. Fuels from woody biomass. Annual report, March 1, 1980-February 28, 1981 (Hybrid poplars, European black alders, white pine, balsom), 9:2101 (R;US)
**Genetic Engineering**
Tree species and management strategies for biomass production in the Lake States. Fuels from woody biomass. Annual report, March 1, 1980-February 28, 1981 (Hybrid poplars, European black alders, white pine, balsom), 9:2101 (R;US)
**TRIGA TYPE REACTORS**
**Fuel Elements**
Improved capability of U-ZrH fuels, 9:2353 (RA;US)
**Fuel Pins**
Neutronic performance of a 14 MW TRIGA reactor: LEU vs HEU fuel, 9:2369 (RA;US)
**TRIPLET PARTICLES**
*See QUARKS*
**TRITIATED COMPOUNDS**
*See TRITIUM COMPOUNDS*
**TRITIUM**
**Dissolution**
Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3394 (J;GB)
**Fuel Cycle**
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Inhalation**
Dissolution of tritiated glass microballoon fragments: implications for inhalation exposure, 9:3394 (J;GB)
**Isotope Effects**
Accurate calculations of the rate constants and kinetic isotope effects for tritium-substituted analogues of the $H + H_2$ reaction, 9:2931 (J;US)
**Isotope Separation**
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Mass Spectroscopy**
Review of applications of mass spectrometry to low-level radionuclide metrology. Rev. 1, 9:2885 (R;US)
**Materials Handling**
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Radiochemistry**
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3036 (R;DE;In German)
**Safety**
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)
**Separation Processes**
Basic science and technology, 9:1928 (RA;US)
**TRITIUM COMPOUNDS**
**Chemical Preparation**
Labelling of insuline and insuline derivatives with tritium and carbon-14, 9:3036 (R;DE;In German)
**TRITIUM IONS**
**Collisions**
Reflection of low energy light-element ions from solid surfaces, 9:4169 (RA;JP;In Japanese)
**Dissociation**
Measurement of the branching ratio for the dissociative recombination of $H_3^+ + e$, 9:3559 (J;US)
**Electron-Ion Collisions**
Measurement of the branching ratio for the dissociative recombination of $H_3^+ + e$, 9:3559 (J;US)
**Recombination**
Measurement of the branching ratio for the dissociative recombination of $H_3^+ + e$, 9:3559 (J;US)
**TRITIUM TARGET**
**Fabrication**
Preparation and characterization of tritium targets, 9:3158 (J;US)
**TRITON REACTIONS**
**Stripping**
Electromagnetic properties of isomers in $^{210}Pb$, 9:3925 (J;US)
**TROMMELS**
**Design**
Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981, 9:2640 (R;US)
**Operation**
Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981, 9:2640 (R;US)
**Performance**
Recapitulative analysis of model, laboratory, and full-scale trommel performance investigations by NCRR, 1980-1981, 9:2640 (R;US)
**TROPICAL REGIONS**
**Temperature Distribution**
Evaporation-limited tropical temperatures as a constraint on climate sensitivity, 9:3255 (J;US)

**TROPOSPHERE**
**Chemical Composition**
Atmospheric Bromine in the Arctic, 9:3270 (J;US)
**TRU WASTES**
*See ALPHA-BEARING WASTES*
**TRUCKS**
**Aerodynamics**
An investigation of the internal and external aerodynamics of cattle trucks. Final Report, 9:2632 (R;US)
**Blast Effects**
Blast loading computations over complex structures, 9:3248 (RA;US)
**Road Tests**
Demonstration and evaluation of plastic bag streamlining on highway trucks for drag reduction and energy savings. Final report, 9:2631 (R;US)
**Scale Models**
Demonstration and evaluation of plastic bag streamlining on highway trucks for drag reduction and energy savings. Final report, 9:2631 (R;US)
**Ventilation**
An investigation of the internal and external aerodynamics of cattle trucks. Final Report, 9:2632 (R;US)
**TRX-1**
*See REVERSE-FIELD PINCH*
**TUBES**
*For objects of tubular shape; not for DRIFT TUBES, ELECTRON TUBES or IMAGE STORAGE TUBES.*
**Cracks**
Initiation and propagation of stress-corrosion cracking of Alloy 600 in high-temperature water (PWR), 9:2215 (R;US)
**Eddy Current Testing**
Particular treatments in Eddy current technique. Application to the control of corrugated tubes, 9:3086 (R;FR;In French)
**Fabrication**
Low-cost tubular sapphire optical cells for study of phase separation in fluid mixtures, 9:3214 (J;US)
**Roughness**
Effects of surface roughness of horizontal cylinders on heat transfer to air under conditions of natural convection, 9:3085 (TJ;US)
**Stress Corrosion**
600 MW steam generator repair program. Hydraulically expanded tube to tubesheet joints, 9:2259 (RA;CA)
**TUBES (CONDUITS)**
*See PIPES*
**TUMAN DEVICES**
**Magnetic Fields**
Study on the poloidal magnetic fields in the "Tuman-3" device, 9:4181 (R;SU;In Russian)
**TUMOR PROMOTERS**
**Biological Effects**
Inhibition of mouse skin tumor promotion by several inhibitors of arachidonic acid metabolism, 9:3422 (J;US)
**TUMORS**
*See NEOPLASMS*
**TUNGSTATES**
**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**TUNGSTEN**
**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Hadronic Atoms**
Precision measurement of the magnetic moment of the Σp hyperon, 9:3715 (J;US)
**Photoelectron Spectroscopy**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**Proton Reactions**
Prompt muon-neutrino production in a 400-GeV proton beam-dump experiment, 9:3727 (J;US)
**Sorptive Properties**
All-electron local-density theory of alkali-metal bonding on transition-metal surfaces: Cs on W(001), 9:2717 (J;US)
Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces, 9:2963 (J;US)
**Work Functions**
All-electron local-density theory of alkali-metal bonding on transition-metal surfaces: Cs on W(001), 9:2717 (J;US)
**X-Ray Fluorescence Analysis**
Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2891 (R;ZA)
**TUNGSTEN COMPLEXES**
**Electrochemistry**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Molecular Structure**
Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2939 (J;US)
**Photochemistry**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Spectroscopy**
Spectroscopic, electrochemical, and photochemical properties of molybdenum(II) and tungsten(II) halide clusters, 9:2941 (J;US)
**Synthesis**
Stereochemical and electronic control of M-$SO_2$ bonding geometry in $d^6$ molybdenum and tungsten $SO_2$ complexes: novel $n^1 \leftarrow n^2$ $SO_2$ linkage isomerization in $Mo(CO)_2(PPh_3)_2(CNR)(SO_2)$ and structures of $Mo(CO)_3(P\text{-}i\text{-}Pr_3)_2(SO_2)$ and $[Mo(CO)_2(py)(PPh_3)(\mu\text{-}SO_2)]_2$, 9:2939 (J;US)
**TUNGSTEN ORES**
**Chemical Analysis**
Determination, by X-ray-fluorescence spectrometry, of tin and tungsten in ores, concentrates, and residues of scheelite, wolframite, and cassiterite, 9:2891 (R;ZA)
**TUNGSTEN OXIDES**
**Catalytic Effects**
Catalysts for upgrading solvent refined lignite, 9:1778 (D;US)
**Photoelectron Spectroscopy**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**TURBINES**
*See also HYDRAULIC TURBINES*
*WIND TURBINES*
**Pollution Abatement**
The use of fuel additives to control plume opacity of turbine engine test cells. Final report Mar 78-Oct 81, 9:1862 (R;US)
**TURBULENCE**
**Navier-Stokes Equations**
New representation of Navier-Stokes equations governing self-similar homogeneous turbulence, 9:3605 (J;US)
**TURKEY**
**Regulations**
Act No. 2690 concerning the Turkish Atomic Energy Association, 9:4268 (R;TR;In Turkish)
**TURNOVER (RADIONUCLIDES)**
*See RADIONUCLIDE KINETICS*
**TWO-PHASE FLOW**
Two-phase flow studies, 9:2169 (R;US)
**Densitometers**
Computation of the density of a two-phase mixture using data from a three-beam gamma densitometer, 9:3190 (R;AT;In German)
**Mixing**
Detection of flow mixing processes using transmission methods in high-duty heat exchanging apparatus. Final report for the sub-project E6, 9:3082 (R;DE;In German)

**Research Programs**
Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, June 1, 1983-August 31, 1983, 9:1759 (R;US)
**Stratification**
Experimental studies of reflooding in horizontal fuel channels, 9:2418 (RA;CA)

## U

**UCLLL**
*See LAWRENCE LIVERMORE LABORATORY*
**U-GAS PROCESS**
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)
**UKAEA-DIDO REACTOR**
*See DIDO REACTOR*
**ULTRASONIC WAVES**
**Wave Propagation**
Theory of pulse propagation in fluid-saturated porous layers, 9:4015 (R;US)
**ULTRASONICS**
*See ULTRASONIC WAVES*
**UNDERGROUND BUILDINGS**
*See EARTH-COVERED BUILDINGS*
**UNDERGROUND DISPOSAL**
**Environmental Impacts**
Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley, 9:2038 (J;US)
**Feasibility Studies**
R and D program concerning radioactive waste disposal in deep geologic formation (Study of an argilaceous formation in Belgium). Summary of works carried out in the years 1975-1979, 9:1947 (R;XE;In French)
**Health Hazards**
Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82, 9:1793 (R;US)
**Licensing**
Preparing to license deep disposal facilities. The international scene, 9:1975 (RA;CA)
**Safety**
Safety and health in underground mine waste disposal. Open file report Oct 81-Dec 82, 9:1793 (R;US)
**UNDERGROUND EXPLOSIONS**
Glass produced by underground nuclear explosions (Rainier), 9:3252 (R;US)
**UNDERGROUND GASIFICATION**
*See IN-SITU GASIFICATION*
**UNDERGROUND MINING**
*See also LONGWALL MINING*
**Acid Mine Drainage**
Investigation of the mechanics of mine acid formation in underground coal mine drainage. Open file report May 78-Jul 82, 9:1803 (R;US)
**Aerial Surveying**
Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations, 9:1805 (R;US)
**Roofs**
Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations, 9:1805 (R;US)
**UNDERGROUND SPACE**
**Energy Consumption**
Energy economy of underground spaces and heat storage in bedrock, 9:2626 (R;FI;In Finnish)
**UNDERGROUND STORAGE**
**Feasibility Studies**
Study of storage in a captive aquifer used as a geothermal reservoir. Final report, 9:2511 (R;XE;FR)
**UNDERWATER FACILITIES**
**Construction**
North-East Grondin experimental station, 9:1836 (BA;GB)
**Design**
North-East Grondin experimental station, 9:1836 (BA;GB)
**Safety**
Undersea excavation test for the protection of submerged equipment in the arctic seas (Installation of underwater facilities in an excavation of seabed for protection against iceberg scour), 9:1837 (BA;GB)
**UNDERWATER VEHICLES**
*See SUBMARINES*
**UNEMPLOYMENT**
*See EMPLOYMENT*
**UNIFIED GAUGE MODELS**
*See also WEINBERG LEPTON MODEL*
*WEINBERG-SALAM GAUGE MODEL*
**Asymptotic Solutions**
Grand unified asymptotic-free model, 9:3831 (RA;SU;In Russian)
**Coupling Constants**
Gauge hierarchy problem, 9:3827 (R;BR)
**Graded Lie Groups**
Grand unified asymptotic-free model, 9:3831 (RA;SU;In Russian)
**Particle Interactions**
Neutron-antineutron oscillations from an experimental point of view, 9:3624 (RA;HU)
**SO Groups**
Discrete symmetries in SO(N) grand unified groups and the survival hypothesis, 9:3789 (R;SU)
SO(14) unification of 3+1 families, 9:3797 (R;XA)
**SU Groups**
Do 't Hooft anomaly equations know about Georgi-Glashow grand unification, 9:3834 (R;IL)
**SU-5 Groups**
Approach to gauge hierarchy in the minimal SU(5) model of grand unification, 9:3801 (R;XA)
**Symmetry Breaking**
Necessity of intermediate mass scales in grand unified theories with spontaneously broken CP invariance, 9:3824 (R;XA)
SO(14) unification of 3+1 families, 9:3797 (R;XA)
Spontaneous breaking of global B-L symmetry and matter-antimatter oscillations in grand unified theories, 9:3798 (R;XA)
**UNIFIED-FIELD THEORIES**
*Prior to March 1983 this concept was indexed to EINSTEIN-SCHROEDINGER THEORY or UNIFIED GAUGE MODELS.*
Prospects for further unification, 9:3821 (R;US)
**UNION OF SOVIET SOCIALIST REPUBLICS**
*See USSR*
**UNITED KINGDOM**
**Uranium Deposits**
Origin of uranium and other metal concentrations in the Helmsdate granite and the Devonian sediments of the north-east of Scotland, 9:1906 (B;GB)
**UNITED STATES OF AMERICA**
*See USA*
**UNIVERSE**
**Entropy**
Entropy from extra dimensions, 9:3473 (J;US)
**UNLOADING (REACTOR)**
*See REACTOR FUELING*
**UPSILON-10500 RESONANCES**
**Hadronic Particle Decay**
Observation of baryons in B-meson decay, 9:3713 (J;US)
**UPSILON-9500 RESONANCES**
**Particle Decay**
Gluon fragmentation in T(1S) decays, 9:3620 (R;DE)
**URALS ATOMIC POWER STATION**
*See BELOYARSK-3 REACTOR*
**URANIUM**
*See also DEPLETED URANIUM*

**Charged-Particle Transport**
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
**Ion Exchange**
Synthesis and ion exchange properties of grafted poly(p-phenylene terephthalamide), 9:1914 (B;ZA)
**Leaching**
Miscellaneous programs, 9:1929 (RA;US)
**Photoionization**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**Photon-Atom Collisions**
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
**Recovery**
Ion exchange and adsorption in nuclear chemical engineering, 9:2886 (R;US)
Protocol between the National Laboratory of Industrial Engineering and Technology of Portugal and the Junta de Energia Nuclear of Spain on supply and transfer of technology on uranium extraction from phosphoric acid, 9:1913 (R;PT;In Portuguese)
**Separation Processes**
Chemistry research and development. Annual progress report, October 1, 1981-September 30, 1982, 9:1930 (R;US)
**Supply and Demand**
Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles, 9:1905 (RA;CA)
**Welding**
Welding of uranium and uranium alloys, 9:2707 (R;US)
**X-Ray Fluorescence Analysis**
Determination, by x-ray-fluorescence spectrometry, of gold and uranium on resin, 9:2892 (R;ZA)

**URANIUM 233**
**Criticality**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material, 9:3075 (B;US)
**Processing**
Miscellaneous programs, 9:1929 (RA;US)

**URANIUM 234**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Excretion**
Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen, 9:3391 (J;GB)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**URANIUM 235**
**Criticality**
American National Standard: use of borosilicate-glass raschig rings as a neutron absorber in solutions of fissle material, 9:3075 (B;US)
**Laser Isotope Separation**
Apparatus for enrichment of uranium by double photoionization (Patent application), 9:1916 (TG;US)
Process for separation of isotopes from a gaseous mixture (Patent application), 9:1920 (TG;US)
**Radioecological Concentration**
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)

**URANIUM 235 TARGET**
**Neutron Reactions**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)

**URANIUM 238**
**Activation Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Excretion**
Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen, 9:3391 (J;GB)
**Laser Isotope Separation**
Apparatus for enrichment of uranium by double photoionization (Patent application), 9:1916 (TG;US)
Process for separation of isotopes from a gaseous mixture (Patent application), 9:1920 (TG;US)
**Multipole Transitions**
Nonradiative excitation of the muonic atom $^{238}U$ as an inverse conversion process, 9:3930 (R;SU)
**Muonic Atoms**
Nonradiative excitation of the muonic atom $^{238}U$ as an inverse conversion process, 9:3930 (R;SU)
**X-Ray Fluorescence Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)

**URANIUM 238 TARGET**
**Iron 56 Reactions**
Charge and mass exchange in $^{56}Fe$-induced reactions at 8.3 MeV/nucleon, 9:3891 (J;US)
**Oxygen 16 Reactions**
Quark matter formation in high energy nucleus-nucleus collisions - predictions and observations, 9:3929 (RA;XC)
**Proton Reactions**
Identification of $^{233}Ac$, 9:3935 (J;US)

**URANIUM ALLOYS**
*See also URANIUM BASE ALLOYS*
**Welding**
Welding of uranium and uranium alloys, 9:2707 (R;US)

**URANIUM BASE ALLOYS**
**Superconductivity**
Superconducting ground state of a strongly interacting electron system: $UBe_{13}$, 9:2705 (R;US)

**URANIUM COMPLEXES**
**Structural Chemical Analysis**
Spectroscopic investigations of uranium(V) complexes with the coordination number six and eight, 9:3034 (R;DE;In German)

**URANIUM COMPOUNDS**
*See also URANIUM NITRATES*
*URANYL COMPOUNDS*
Some recent advances in uranocene chemistry (Benzocyclooctatetraene), 9:2909 (R;US)

**URANIUM DEPOSITS**
*See also YEELIRRIE DEPOSIT*
**Neutron-Neutron Logging**
Computer codes for PFN and multi-element log analysis, 9:1908 (R;US)
**Origin**
Origin of uranium and other metal concentrations in the Helmsdate granite and the Devonian sediments of the north-east of Scotland, 9:1906 (B;GB)
**Prospecting**
Uranium and thorium reserves of the world. Prospecting, mining, and costs, 9:1907 (B;DE;In German)

**URANIUM DIOXIDE**
**Enthalpy**
Thermophysical properties of reactor fuels, 9:1926 (BA;US)
**Fabrication**
Development and demonstration of an advanced extended-burnup fuel-assembly design incorporating urania-gadolinia. Third semi-annual progress report, April-September 1982, 9:2217 (R;US)
**Fuel-Coolant Interactions**
Contribution to the study of the thermal interaction between uranium oxide and sodium, 9:2277 (R;FR;In French)
**Physical Properties**
Consistency in thermophysical properties: enthalpy, heat capacity, thermal conductivity and thermal diffusivity of solid $UO_2$, 9:1925 (BA;US)
**Thermal Conductivity**
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)
**Thermal Diffusivity**
Measurement of the thermal diffusivity of molten $UO_2$, 9:2465 (TG;US)

**URANIUM HEXAFLUORIDE**
**Absorption Spectra**
Spectral studies of cold $UF_6$ solutions, 9:3546 (J;US)

**Atmospheric Chemistry**
Sampling and characterization of aerosols formed in the atmospheric hydrolysis of $UF_6$, 9:3273 (R;US)
**Confinement**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. I. Experiment, 9:3442 (J;US)
**Electron-Molecule Collisions**
Cross sections for electron impact excitation of electronic states in $UF_6$ at incident electron energies of 10, 20, and 40 eV, 9:3543 (J;US)
**Excited States**
Ab initio studies of excited states of polyatomic molecules including spin-orbit and multiplet effects: The electronic states of $UF_6$, 9:3542 (J;US)
**Infrared Spectra**
Spectral studies of cold $UF_6$ solutions, 9:3546 (J;US)
**Mass Resolution**
Behavior of $Cs^+$-$UF^-_6$ ion-pair plasmas in radiofrequency quadrupole-dipole fields. II. Theory, 9:1919 (J;US)
**Ultraviolet Spectra**
Spectral studies of cold $UF_6$ solutions, 9:3546 (J;US)
**Vibrational States**
Vibrational relaxation of $UF_6$: Ultrasonic measurements in mixtures with CO, 9:2833 (J;US)

**URANIUM II**
*See URANIUM 234*

**URANIUM ISOTOPES**
*See also URANIUM 233*
*URANIUM 234*
*URANIUM 235*
*URANIUM 238*
**Laser Isotope Separation**
Process and apparatus for the separtaion of isotopes, 9:1915 (TG;US)

**URANIUM MINES**
**Contracts**
Roxby Downs (Indenture Ratification) Act, 1982 (No. 52 of 1982), 9:1911 (R;AU)
**Radioactive Waste Disposal**
Innovation required in the disposal of uranium mine wastes, 9:1969 (RA;CA)
**Regulations**
Uranium Mining (Environment Control) Act 1979 No. 46 of 1979, 9:2044 (R;AU)

**URANIUM NITRATES**
**Processing**
Miscellaneous programs, 9:1929 (RA;US)

**URANIUM ORES**
**Mining**
Roxby Downs (Indenture Ratification) Act, 1982 (No. 52 of 1982), 9:1911 (R;AU)
Uranium (Yeelirrie) Agreement Act, 1978 - No. 110 of 1978, 9:1909 (R;AU)
**Quantitative Chemical Analysis**
Preparation and certification of a uranium reference material, 9:2894 (R;ZA)
**Solution Mining**
Development of environmentally attractive leachants. Volume 1. A minitest for in situ uranium leaching, 9:1912 (R;US)

**URANIUM RESERVES**
**Global Aspects**
Kinetics of resource utilization in large energy supply systems. Uranium resources and fuel cycles, 9:1905 (RA;CA)
Uranium and thorium reserves of the world. Prospecting, mining, and costs, 9:1907 (B;DE;In German)

**URANYL COMPOUNDS**
*See also URANYL FLUORIDES*
*URANYL PHOSPHATES*
**Absorption Spectra**
Observation of the asymmetric O—U—O stretch in the vibronic absorption spectrum of uranyl formate monohydrate, 9:3040 (J;US)
**Fluorescence**
Observation of the asymmetric O—U—O stretch in the vibronic absorption spectrum of uranyl formate monohydrate, 9:3040 (J;US)

**URANYL FLUORIDES**
**Radioactive Aerosols**
Sampling and characterization of aerosols formed in the atmospheric hydrolysis of $UF_6$, 9:3273 (R;US)

**URANYL PHOSPHATES**
**Crystal Structure**
Imperfections and phase transformations by mono-N-alkylammonium-uranium glimmers, 9:3035 (R;DE;In German)
**Order-Disorder Transformations**
Imperfections and phase transformations by mono-N-alkylammonium-uranium glimmers, 9:3035 (R;DE;In German)

**URBAN AREAS**
**Climates**
Aggregation of U.S. population centers into climate regions, 9:2096 (BA;US)
**Fires**
Analysis of the large urban fire environment, 9:3232 (RA;US)
Fire in targeting urban/industrial areas, 9:3243 (RA;US)
Heat conduction analog model of urban fire spread, 9:3236 (RA;US)
Large urban fire environment: trends and model city predictions, 9:3233 (RA;US)
Modeling urban fire growth, 9:3239 (RA;US)
Moving boundaries: a numerical model, 9:3237 (RA;US)

**URETHRA**
*See URINARY TRACT*

**URINALYSIS**
*See URINE*

**URINARY TRACT**
**Injuries**
Significance of determination of the efficient renal plasma circulation and glomerular filtration in evaluation of early changes of kidney functional state during "non-complicated" skeletal trauma in children, 9:3375 (RA;SU;In Russian)

**URINE**
**Radiochemical Analysis**
Levels of $^{234}U$, $^{238}U$ and $^{230}Th$ in excreta of uranium mill crushermen, 9:3391 (J;GB)

**US DEPARTMENT OF HOUSING AND URBAN DEVELO**
*See US HUD*

**US DOD**
**Procurement**
Questionable practices in the selection of transportation services for small lots of hazardous or sensitive cargo, 9:2528 (R;US)

**US DOE**
*See also BNL*
*HANFORD RESERVATION*
*IDAHO NATIONAL ENGINEERING LABORATORY*
*LAWRENCE LIVERMORE LABORATORY*
*NEVADA TEST SITE*
*SANDIA LABORATORIES*
*SAVANNAH RIVER PLANT*
*STANFORD LINEAR ACCELERATOR CENTER*
*US FERC*
**Budgets**
Changing energy research priorities, 9:2541 (R;US)
**Program Management**
Analysis of DOE's Sunset review, 9:2529 (R;US)
**Quality Assurance**
Draft issue of proposed document entitled Management Program to Assure Quality, 9:4234 (R;US)
**Research Programs**
Alcohol-Fuel-Technology Grant Program: an evaluation and summary, 9:2083 (R;US)
Department of Energy programs on cogeneration and their economics, 9:2548 (BA;US)
Tritium handling requirements and development for fusion, 9:4159 (RA;XA)

**US EPA**
**Research Programs**
Assessment of cold-climate environmental research priorities. Appendixes A, B, 9:2538 (R;US)

**US FERC**
**Audits**
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
**Program Management**
Federal Energy Regulatory Commission has expedited case processing; additional improvements needed, 9:2530 (R;US)
**US HUD**
**Allocations**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**Budgets**
Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984, 9:2554 (R;US)
**US NRC**
*United States Nuclear Regulatory Commission-prior to 1975 was part of US AEC.*
**Coordinated Research Programs**
Development and organization of the industry/NRC procedures guide, 9:2487 (BA;US)
**Legal Aspects**
Nuclear Regulatory Commission Issuances, February 1983. Vol. 17, No. 2, 9:2303 (R;US)
Nuclear Regulatory Commission issuances, January 1983. Vol. 17, No. 1, 9:2302 (R;US)
**USA**
*See also FEDERAL REGION IV*
*FEDERAL REGION X*
**Climates**
Aggregation of U.S. population centers into climate regions, 9:2096 (BA;US)
**Energy Conservation**
Energy conservation policies, 9:2536 (BA;US)
**Human Populations**
Aggregation of U.S. population centers into climate regions, 9:2096 (BA;US)
**Nuclear Facilities**
Nuclear Regulatory Commission Issuances, February 1983. Vol. 17, No. 2, 9:2303 (R;US)
Nuclear Regulatory Commission issuances, January 1983. Vol. 17, No. 1, 9:2302 (R;US)
**Nuclear Power Plants**
Power reactor events, January-February 1983. Vol. 5, No. 1, 9:2438 (R;US)
**Passive Solar Heating Systems**
'Passive' utilization of solar energy, 9:2135 (RA;DE;In German)
**USSR**
**National Defense**
Strategic threat, 9:3234 (RA;US)
**UTERINE CERVIX CARCINOMA**
*See CARCINOMAS*
**UTERUS**
**Internal Irradiation**
Source localization with semiconductor detector in the intracavitary therapy, 9:3373 (RA;HU;In Hungarian, English)
**Irradiation Procedures**
Localization technique applied for the combined radiation treatment of uterine cancer, 9:3370 (RA;HU;In Hungarian, English)
**UTILITIES**
*See ELECTRIC UTILITIES*
*GAS UTILITIES*
*PUBLIC UTILITIES*

## V

**VACANCIES**
**Formation Heat**
Temperature-dependent behavior of positron annihilation in metals, 9:2766 (BA;US)
**VACUUM STATES**
**Band Theory**
New vacuum structure, background strength and confinement, 9:3748 (R;XA)
**VACUUM SYSTEMS**
**Leak Detectors**
Modification for correcting a vacuum design fault in the Veeco Model MS 170 Leak Detector, 9:4186 (R;US)
**Seals**
Fabrication of a hermetically sealed connector, 9:3098 (R;US)
**VAGINA**
*See FEMALE GENITALS*
**VALENCE**
**Control**
Control of redox conditions during sorption measurements, 9:2907 (R;US)
**VALENCE ELECTRONS**
*See ELECTRONS*
*VALENCE*
**VALENCY STATES**
*See VALENCE*
**VALVES**
**Design**
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1753 (R;US)
**Specifications**
H-Coal pilot plant block-valve experience through coal run No. 7 in the H-Coal Pilot Plant, 9:1753 (R;US)
**VANADATES**
*Specific compounds, except those of significance to energy research and development, should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.*
**Crystal Structure**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**Magnetic Properties**
Crystallography and magnetic properties of transuranium element oxygen compounds (Np, Pu and Am), 9:3033 (R;FR;In French)
**VANADIUM**
**Ecological Concentration**
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
**VANADIUM ALLOYS**
**Crystal Structure**
Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD/sub\ x/$. I. Preparation and neutron powder diffraction, 9:2709 (J;US)
Deuterium site occupation in the oxygen-stabilized eta-carbides $Zr_3V_3OD/sub\ x/$. II. Application of a geometric model, 9:2710 (J;US)
**Oxidation**
Microstructure of vanadium-oxygen alloys, 9:2796 (BA;US)
**VANADIUM HYDRIDES**
**Electronic Structure**
Electronic structure of metal hydrides. VI. Photoemission studies and band theory of VH, NbH, and TaH, 9:2785 (J;US)
**VANADIUM OXIDES**
**Catalytic Effects**
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
**Muonic Molecules**
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3532 (R;SU;In Russian)
**Spin Orientation**
Study on muon depolarization at magnetic phase transition in $V_2O_3$, 9:3532 (R;SU;In Russian)

**Structural Chemical Analysis**
Structure of $VO(H_2O)_5^{2+}$ in cross-linked poly(vinyl alcohol), 9:2780 (J;US)

**VANADIUM SELENIDES**
**Physical Radiation Effects**
Irradiation of layered metallic dichalcogenides: disorder in the charge density waves (Electron irradiation), 9:2815 (R;FR;In French)

**VANADIUM SILICIDES**
**Fabrication**
Superconducting $V_3Si$ produced by pulsed laser annealing, 9:2744 (J;GB)
**Physical Radiation Effects**
Relationship between the electronic density of states and the superconducting critical temperature of disordered $V_3Si$, 9:2860 (J;US)
**Superconductivity**
Superconducting $V_3Si$ produced by pulsed laser annealing, 9:2744 (J;GB)
**Transition Temperature**
Relationship between the electronic density of states and the superconducting critical temperature of disordered $V_3Si$, 9:2860 (J;US)

**VAPOR PRESSURE**
**Correlations**
High P/T phase and volumetric behavior of coal-liquid constituents. Quarterly report, July 1, 1983-September 30, 1983, 9:1786 (R;US)

**VAPORIZATION**
*See EVAPORATION*

**VARIABLE STARS**
**Visible Spectra**
Correlated x-ray and optical time variability of TT arietis, 9:3481 (J;US)
**X-Ray Spectra**
Correlated x-ray and optical time variability of TT arietis, 9:3481 (J;US)

**VEGETATION**
*See PLANTS*

**VENTILATION DUCTS**
*See DUCTS*

**VENTILATION SYSTEMS**
**Control Equipment**
Ventilation for control of indoor air quality: a case study (Minnesota), 9:2630 (J;GB)
**Energy Consumption**
Energy conservation of ventilation in commercial and public buildings. Basis. Method file, 9:2612 (R;FI;In Finnish)

**VERSENE**
*See EDTA*

**VESSELS**
*See CONTAINERS*

**VESSELS (CHEMICAL REACTIONS)**
*See CHEMICAL REACTORS*

**VESSELS (PRESSURE)**
*See PRESSURE VESSELS*

**VESSELS (REACTOR)**
*See REACTOR VESSELS*

**VHTR REACTOR**
**Reactor Cooling Systems**
System design considerations on the cooling system of the experimental multi-purpose very high temperature gas cooled reactor, 9:2245 (R;JP;In Japanese)
**Reactor Instrumentation**
Development on experimental VHTR instrumentation, 9:2380 (R;XA)

**VINCA R-A REACTOR YUGOSLAVIA**
*See R-A REACTOR*

**VINYL MONOMERS**
**Vibrational States**
Vibrational frequencies for silaacetylene and its silylidene and vinylidene isomers, 9:2990 (J;US)

**VIRUSES**
**Biological Accumulation**
Accumulation of sediment-associated viruses in shellfish, 9:3419 (J;US)

**VISCOSIMETERS**
**High Temperature**
Improvement in the design and extension of operating range of viscometers and thermal conductivity cells. Annual technical progress report, 9:3203 (R;US)

**VISIBILITY**
**Pollution Sources**
Source apportionment methods applied to the determination of the origin of ambient aerosols that affect visibility in forested areas, 9:3265 (R;US)

**VISIBLE RADIATION**
**Scattering**
Time reversal theory in light scattering, 9:4004 (RA;BR;In Portuguese)
**T Invariance**
Time reversal theory in light scattering, 9:4004 (RA;BR;In Portuguese)

**VISITOR CENTERS**
*See PUBLIC BUILDINGS*

**VITRIFICATION**
**Economic Analysis**
In-situ vitrification of transuranic wastes: systems evaluation and applications assessment, 9:1998 (R;US)

**VITRINITE**
*See MACERALS*

**VLASOV EQUATION**
*See BOLTZMANN-VLASOV EQUATION*

**VLASOV INSTABILITY**
*See BOLTZMANN-VLASOV EQUATION*

**VOLATILIZATION**
*See EVAPORATION*

**VOLCANOES**
**Eruption**
Stratospheric sulfate from El Chichon and the Mystery Volcano, 9:3269 (J;US)

**VOLTAIC CELLS**
*See ELECTRIC BATTERIES*

**VOMITING**
**Biological Radiation Effects**
Antiemetic studies both pre and post exposure: preliminary findings. Preliminary report Jan-Oct 82, 9:3385 (R;US)

**VYCOR**
**Thermal Conductivity**
Low-temperature thermal conductivity of porous Vycor, 9:2875 (J;NL)

## W

**WAGR REACTOR**
**Failed Element Detection**
Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry, 9:2241 (R;XA)
Split-count technique for failed fuel detection and location, 9:2240 (R;XA)
**Fuel Element Failure**
Analysis of fission products in the Windscale A.G.R. coolant using on-line $\gamma$ spectrometry, 9:2241 (R;XA)

**WAIRAKEI GEOTHERMAL FIELD**
**Hydrology**
Radioactive tracers in geothermal underground water flow studies, 9:2152 (R;NZ)

**WAK**
*Wiederaufarbeitungsanlage Karlsruhe.*
**Operation**
Experience with the storage of high active waste at WAK, 9:1940 (R;DE)

**WASTE BURIAL**
*See UNDERGROUND DISPOSAL*

**WASTE DISPOSAL**
*See also RADIOACTIVE WASTE DISPOSAL*
*SANITARY LANDFILLS*
*UNDERGROUND DISPOSAL*

**Remote Sensing**
Mine waste location by satellite imagery. Open file report 30 May 80-18 Dec 82, 9:1794 (R;US)

**WASTE HEAT BOILERS**
**Corrosion**
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2648 (R;US)
**Fluidized Bed**
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2648 (R;US)
**Materials**
Corrosion of fluidized-bed boiler materials in synthetic flue gas, 9:2648 (R;US)

**WASTE HEAT UTILIZATION**
**Research Programs**
Department of Energy programs on cogeneration and their economics, 9:2548 (BA;US)

**WASTE MANAGEMENT**
*See also RADIOACTIVE WASTE MANAGEMENT*
*WASTE DISPOSAL*
**Radiation Protection**
International regulations for radiation protection, 9:1958 (R;DE)
**Recommendations**
Technical, environmental and regulatory aspects of waste management and their reflection in the IAEA programme, 9:1959 (R;DE)

**WASTE OILS**
**Bleaching**
Re-refining of industrial spent oils, 9:1852 (R;FI;In Finnish)
**Decantation**
Re-refining of industrial spent oils, 9:1852 (R;FI;In Finnish)
**Recycling**
Re-refining of industrial spent oils, 9:1852 (R;FI;In Finnish)

**WASTE PROCESSING PLANTS**
*See also RESOURCE RECOVERY FACILITIES*
**Feasibility Studies**
Resource Recovery Co-Disposal Demonstration Project, Middlesex County, New Jersey: feasibility study and recommendation for implementation. Final report, 9:2655 (R;US)
**Specifications**
High temperature incineration. Densification of granules from high temperature incineration. Incineration of solid wastes contaminated with plutonium, 9:1949 (R;XE)
**Waste Heat Utilization**
Use of waste heat from waste water treatment plants by means of adsorption heat pumps. Preparatory study, 9:2657 (R;SE;In Swedish)

**WASTE WATER**
**Anaerobic Digestion**
Biogasification of Walt Disney World biomass waste blend. Annual report Jan-Dec 82, 9:2074 (R;US)
**Chemical Analysis**
Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, July-September 1983, 9:1785 (R;US)

**WASTE-FUELED POWER PLANTS**
*See REFUSE-FUELED POWER PLANTS*

**WASTE-ROCK INTERACTIONS**
**Measuring Methods**
Batch method of measuring sorption ratios, 9:3287 (R;US)
Control of redox conditions during sorption measurements, 9:2907 (R;US)

**WATER**
*See also GROUND WATER*
*HEAVY WATER*
*WASTE WATER*
**Agglomeration**
Isotope enrichment during the formation of water clusters in supersonic free jet expansions, 9:2952 (J;US)
**Charge Density**
Search for fractional charges in water, 9:3724 (J;US)
**Chemical Reaction Yield**
Quantum chemical studies of a model for peptide bond formation: formation of formamide and water from ammonia and formic acid, 9:2966 (J;US)
**Decomposition**
Decomposition of water adsorbed in iron and nickel films, 9:2692 (RA;BR;In Spanish)
**Emission Spectra**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Monitoring**
Determination of moisture and trace impurities in helium by He($2^3$s) flowing afterglow, 9:2253 (J;NL)
**Photoelectron Spectroscopy**
K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields, 9:2847 (J;US)
**Photoionization**
K-shell excitation of $D_2O$ and $H_2O$ ice: Photoion and photoelectron yields, 9:2847 (J;US)
**Purification**
Troubleshooting the General Electric Company Neutron Devices Department's deionized water system, 9:2065 (R;US)
**Radiolysis**
Pulse radiolysis of porphyrin and ferriporphyrin solutions in 2-propanol-carbon tetrachloride systems. Protonation and ligand exchange kinetics, 9:3031 (J;US)
**Raman Spectra**
Raman and infrared spectroscopic studies of the structure of water ($H_2O$, HOD, $D_2O$) in stoichiometric crystalline hydrates and in electrolyte solutions, 9:3528 (R;DE)
**Raman Spectroscopy**
Raman spectroscopy of shocked water, 9:3539 (R;US)

**WATER COOLANT**
*See WATER*

**WATER COOLED REACTORS**
*See also BWR TYPE REACTORS*
*HFR REACTOR*
*HWLWR TYPE REACTORS*
*KUHFR REACTOR*
*LWBR TYPE REACTORS*
*NSRR REACTOR*
*ORR REACTOR*
*OSIRIS REACTOR*
*PWR TYPE REACTORS*
*TRIGA TYPE REACTORS*
**Fuel Management**
Data Base Management Project. Annual report, 29 September 1982-29 September 1983 (Extended burnup), 9:2309 (R;US)

**WATER HEATERS**
**Energy Efficiency**
Field test measurement of energy savings from high efficiency, residential electric appliances. Residential conservation demonstration program, 9:2617 (R;US)
**Heat Pumps**
In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program, 9:2619 (R;US)
**Waste Heat Utilization**
In-field test results of heat-recovery units and heat pumps for domestic water heating. Residential Conservation Demonstration Program, 9:2619 (R;US)

**WATER MODERATOR**
*See WATER*

**WATER PUMPS**
**Design**
Geothermal pumping systems, 9:2168 (R;US)

**WATER QUALITY**
**Regional Analysis**
Characterization of water quality for regional planning, 9:3325 (R;US)

**WATER RESOURCES**
**Contamination**
Nuclear warfare water contamination. Technical report, 9:3327 (R;US)
**Management**
Tennessee Valley water resources: a strategy for the 1980s and beyond, 9:2540 (R;US)

**WATER VAPOR**
**Vibrational States**
Unimolecular and bimolecular reactions in the $C_4H_6$/sup +center-dot/ system: Experiment and theory, 9:3577 (J;US)

**WATER WAVES**
**Damping**
Feasibility study on a submerged wave dampener, 9:1829 (BA;GB)
**Frequency Measurement**
Wave motion and energy transmission derived from wave records, 9:2179 (R;NO)
**Mathematical Models**
Wave motion and energy transmission derived from wave records, 9:2179 (R;NO)
**WATERBORNE PARTICLES**
*See PARTICULATES*
**WATERFLOODING**
**Bench-Scale Experiments**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**Comparative Evaluations**
Enhanced oil recovery by gas injection in a heavy-oil, fractured reservoir - Gela Field, Italy, 9:1840 (BA;GB)
**WATERSHEDS**
**Contamination**
Nuclear warfare water contamination. Technical report, 9:3327 (R;US)
**WATERWALL FURNACES**
*See WATERWALL INCINERATORS*
**WATERWALL INCINERATORS**
**Operation**
Thermal systems for conversion of municipal solid waste. Volume 2. Mass burning of solid waste in large-scale combustors: a technology status report, 9:2653 (R;US)
**Technology Assessment**
Thermal systems for conversion of municipal solid waste. Volume 2. Mass burning of solid waste in large-scale combustors: a technology status report, 9:2653 (R;US)
**WAVE ENERGY CONVERTERS**
**Fabrication**
Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2176 (R;US)
**Optimization**
Simplified optimization and sensitivity analysis of focusing wave power plants, 9:2177 (R;NO;In Norwegian)
**Pneumatics**
Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2176 (R;US)
**Sensitivity Analysis**
Simplified optimization and sensitivity analysis of focusing wave power plants, 9:2177 (R;NO;In Norwegian)
**Testing**
Reference guide to fabrication details and preliminary shakedown testing of a pneumatic wave energy converter, 9:2176 (R;US)
**WAVE POWER**
**Economic Analysis**
Simplified optimization and sensitivity analysis of focusing wave power plants, 9:2177 (R;NO;In Norwegian)
**Forecasting**
Development of wave forecasting methods. Final report, 9:2175 (R;US)
**Frequency Analysis**
Wave motion and energy transmission derived from wave records, 9:2179 (R;NO)
**Seasonal Variations**
Season variations of wave power in Norway, 9:2178 (R;NO)
**Site Surveys**
Season variations of wave power in Norway, 9:2178 (R;NO)
**Spectra**
Development of wave forecasting methods. Final report, 9:2175 (R;US)
**WAVEGUIDES**
**Amplifiers**
Combination ring cavity and backward raman waveguide amplifier, 9:3080 (P;US)
**Coupling**
Comparison of calculated and measured performance of diffused channel-waveguide couplers, 9:4020 (J;US)
**Performance**
Comparison of calculated and measured performance of diffused channel-waveguide couplers, 9:4020 (J;US)
**Raman Effect**
Combination ring cavity and backward raman waveguide amplifier, 9:3080 (P;US)
**WAVES (SHOCK)**
*See SHOCK WAVES*
**WAVES (TRAVELLING)**
*See TRAVELLING WAVES*
**WAZ 16**
*See NICKEL BASE ALLOYS*
**WEAK INTERACTIONS**
Electroweak interactions, 9:3673 (RA;US)
**Instantons**
Instanton-anti-instanton interaction in the O(3) non-linear $\sigma$ model and an exactly soluble fermion theory, 9:3739 (R;XA)
**Sigma Model**
Instanton-anti-instanton interaction in the O(3) non-linear $\sigma$ model and an exactly soluble fermion theory, 9:3739 (R;XA)
**Spin Orientation**
Polarization as a tool for studying the physics of weak interactions, 9:3733 (RA;XC)
**WEAK PARTICLE DECAY**
*See also SEMILEPTONIC DECAY*
**CP Invariance**
CP symmetry in a high magnetic field, 9:3684 (RA;US)
CP-violating polarization in K/sub $\mu 3/^{+}$ and K/sub $\mu 3/^{0}$ decays, 9:3680 (RA;US)
Experiment to measure eta$_{000}$, 9:3682 (RA;US)
Measurement of CP violation in $\Lambda$ decay, 9:3683 (RA;US)
**WEB GROWTH METHOD**
*See DENDRITIC WEB GROWTH METHOD*
**WECS**
*See WIND TURBINES*
**WEEVILS**
*See BEETLES*
**WEINBERG LEPTON MODEL**
**Mixing Ratio**
Nondiagonal Z-decay - Z$\rightarrow$anti e+$\mu$, 9:3808 (RA;HU)
**Radiative Corrections**
Order $\alpha$Gsub($\mu$) corrections to the parity-violating electron-quark potential in the Weinberg-Salam theory: parity-violations in one-electron atoms, 9:3805 (R;XA)
**Symmetry Breaking**
Scalar loops and the Higgs mass in the Salam-Weinberg-Glashow model, 9:3802 (R;XA)
**WEINBERG MODEL**
*See WEINBERG LEPTON MODEL*
**WEINBERG-SALAM GAUGE MODEL**
Electroweak interactions, 9:3673 (RA;US)
Neutrino interactions with nuclei, 9:3675 (RA;US)
**Feynman Diagram**
Detailed calculation of the complete two-loop Higgs-Yukawa beta function in an arbitrary $\alpha$ gauge, 9:3778 (J;US)
**WELDED JOINTS**
**Acoustic Emission Testing**
Investigations of the mechanical behavior of spot welded joints by means of acoustic emission analysis, 9:3097 (TG;US)
**WELDS**
*See WELDED JOINTS*
**WELL COMPLETION**
**Cost**
Evaluation of direct-use-project drilling costs, 9:2165 (R;US)
**WELL DRILLING**
**Cost**
Evaluation of direct-use-project drilling costs, 9:2165 (R;US)
**Environmental Impacts**
Prevention of nuisance and pollution in off-shore exploration and exploitation of hydrocarbons, 9:1854 (BA;GB)
**WELL STIMULATION**
**Computer Codes**
Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report, 9:2170 (R;US)

**Cost Benefit Analysis**
Geothermal wells: the cost benefit of fracture stimulation estimated by the GEOCOM code. Final report, 9:2170 (R;US)

**WELLHEADS**
**Control Systems**
Automated underwater wellhead, 9:1839 (BA;GB)

**WEST GERMANY**
*See FEDERAL REPUBLIC OF GERMANY*

**WEST VALLEY PROCESSING PLANT**
**Radioactive Waste Facilities**
Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley, 9:2038 (J;US)

**WESTERN AUSTRALIA**
**Yeelirrie Deposit**
Uranium (Yeelirrie) Agreement Act, 1978 - No. 110 of 1978, 9:1909 (R;AU)
Uranium (Yeelirrie) Agreement Act 1982 - No. 40 of 1982, 9:1910 (R;AU)

**WESTERN EUROPE**
*See also BELGIUM*
*FEDERAL REPUBLIC OF GERMANY*
*FRANCE*
*ITALY*
*NETHERLANDS*
*PORTUGAL*
*SPAIN*
*SWITZERLAND*
*UNITED KINGDOM*
**Passive Solar Heating Systems**
'Passive' utilization of solar energy, 9:2135 (RA;DE;In German)

**WESTINGHOUSE GASIFICATION PROCESS**
**Evaluation**
Fossil fuel gasification technical evaluation services. Final report 1978-83, 9:1770 (R;US)

**WET-TYPE COOLING TOWERS**
*See COOLING TOWERS*

**WHEY**
**Fermentation**
Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2128 (J;US)

**WILD ANIMALS**
**Population Density**
Coyote-leporid relations on the Idaho National Engineering Laboratory (Canis latrans, Lepus californicus), 9:3313 (RA;US)
**Predator-Prey Interactions**
Coyote-leporid relations on the Idaho National Engineering Laboratory (Canis latrans, Lepus californicus), 9:3313 (RA;US)
**Radioactivity**
Importance of biota in radionuclide transport at the SL-1 radioactive waste disposal area, 9:3292 (RA;US)

**WILDERNESS AREAS**
*See NATURE RESERVES*

**WIND ENERGY CONVERSION SYSTEMS**
*See WIND TURBINES*

**WIND GENERATORS**
*See WIND TURBINES*

**WIND POWER PLANTS**
**Performance Testing**
Test plant for wind power Kalkugnen 1977-1980. Summary of operation results, 9:2183 (R;SE;In Swedish)

**WIND TURBINES**
**Acoustic Measurements**
Aerodynamic sources of acoustic radiation from a single MOD-2 wind turbine, 9:2180 (R;US)
**Stability**
Some experiments on yaw stability of wind turbines with various coning angles, 9:2181 (R;US)

**WINDOWS**
**Energy Balance**
Present and future tendencies of window technique, 9:2597 (RA;DE;In German)

**WINDSCALE ADVANCED GAS-COOLED REACTOR**
*See WAGR REACTOR*

**WOLFRAM**
*See TUNGSTEN*

**WOOD**
**Bibliographies**
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)
**Combustion**
Burnout of large-sized woody fuels, 9:3047 (RA;US)
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)
**Comparative Evaluations**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Cost**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Drying**
Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2124 (R;FI;In Finnish)
**Ignition**
Spontaneous ignition of solids subjected to linearly time-dependent radiant exposure, 9:3048 (RA;US)
**Pyrolysis**
Charcoal as an alternative energy carrier. Pt. 4: Systems studies, 9:2071 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.3: Preparation and use of charcoal and by-products, 9:2073 (R;NO;In Norwegian)
Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2072 (R;NO;In Norwegian)
**Pyrolysis Products**
Charcoal as an alternative energy carrier. Pt.2: Conversion of biomass, 9:2072 (R;NO;In Norwegian)
**Sorting**
Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2124 (R;FI;In Finnish)

**WOOD ALCOHOL**
*See METHANOL*

**WOOD BURNING APPLIANCES**
**Meetings**
Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2092 (R;NO)
**Performance Testing**
Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2092 (R;NO)
**Safety**
Meeting on solid fuel room heaters. Testing for efficiency and safety, 9:2092 (R;NO)

**WOOD FUELS**
*Use of this term is limited to policy, feasibility, and socio-economic studies. For wood properties use WOOD.*
**Bibliographies**
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)
**Combustion Properties**
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples (Finland), 9:2093 (R;FI;In Finnish)
**Comparative Evaluations**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2107 (R;FI;In Finnish)
**Cost**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 2. Industry, 9:2107 (R;FI;In Finnish)
**Fuel Consumption**
Survey completion report: residential fuelwood use in the United States: 1980-81, 9:2087 (R;US)
**Health Hazards**
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)
**Indoor Air Pollution**
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)

**Information Needs**
Residential wood combustion: Volume I. Research needs. Volume II. Annotated RWC bibliography, 9:2090 (R;US)
**Surveys**
Survey completion report: residential fuelwood use in the United States: 1980-81, 9:2087 (R;US)

**WOOD PRODUCTS INDUSTRY**
**Energy Conservation**
Energy research in the mechanical forest industry 1980-1982. Summary, 9:2650 (R;FI;In Finnish)
**Energy Consumption**
Energy research in the mechanical forest industry 1980-1982. Optimization of veneer drying, 9:2651 (R;FI;In Finnish)
Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2124 (R;FI;In Finnish)
Energy research in the mechanical forest industry 1980-1982. Summary, 9:2650 (R;FI;In Finnish)
**Optimization**
Energy research in the mechanical forest industry 1980-1982. Optimization of veneer drying, 9:2651 (R;FI;In Finnish)
**Quality Control**
Energy research in the mechanical forest industry 1980-1982. The influence of pre-grading on drying capacity and the quality of sawn timber, 9:2124 (R;FI;In Finnish)

**WOOD WASTES**
**Combustion Properties**
Properties of indigenous fuels. Part 2. Instructions for the preparation and testing of samples (Finland), 9:2093 (R;FI;In Finnish)
**Comparative Evaluations**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Cost**
Competitiveness of indigenous solid fuels 1982 in Finland, Part 1. Regional and local heating, 9:2106 (R;FI;In Finnish)
**Economic Analysis**
Charcoal as an alternative energy carrier. Pt.1: Resources, 9:2105 (R;NO;In Norwegian)
**Pyrolysis**
Pyrolysis tests with Cornell retort in production of charcoal, 9:2089 (R;NO;In Norwegian)

**WORKERS**
*See PERSONNEL*

**WORKING FLUIDS**
**Evaporation**
Stirling engines with controlled evaporation of a two-phase two-component working fluid, 9:2664 (R;US)

**WYOMING**
**Aerial Surveying**
Correlation of Landsat and air photo linears with roof control problems and geologic features. Report of investigations, 9:1805 (R;US)

## X

**X RADIATION**
**Stray Radiation**
Calculation of stray dose distributions of gamma and X radiation in homogeneous and inhomogeneous media by means of Monte-Carlo methods, 9:3972 (B;DE;In German)

**XENOBIOTICS**
**Biodegradation**
Adaptation of natural microbial communities to degradation of xenobiotic compounds: effects of concentration, exposure time, inoculum, and chemical structure, 9:3379 (J;US)

**XENON**
**Adsorption**
Study of krypton and xenon solid monoshells adsorbed in graphite by transmission electron diffraction, 9:2818 (RA;BR;In Spanish)
**Atom-Molecule Collisions**
Study of excited state energy transfer processes. Final report 1 Jan 81-31 Dec 82, 9:3506 (R;US)
**Auger Electron Spectroscopy**
Surface effects on energies of Auger electrons from Xe(111), 9:2851 (J;US)
**Desorption**
Classical stochastic diffusion theory for desorption of atoms and molecules from solid surfaces, 9:2963 (J;US)
**Hydrostatics**
A new hydrostatic medium for diamond anvil cells to 300 kbar pressure, 9:2881 (J;NL)
**Phase Transformations**
Experiments with phase transitions at very high pressure. Final Report, 9:2825 (R;US)
**Photoelectron Spectroscopy**
Surface effects on energies of Auger electrons from Xe(111), 9:2851 (J;US)
**Spatial Distribution**
Bimodal analysis and spatial control, 9:2321 (RA;CA)
**X-Ray Spectroscopy**
Determination of xenon in irradiated nuclear fuel using a shielded electron microprobe, 9:1927 (R;US)

**XENON 131 TARGET**
**Pion Minus Reactions**
Experimental study of the pion-xenon collisions without particle production at 3.5 GeV/c: asymmetry in proton emission, 9:3901 (R;SU)

**XI MINUS**
**Bound State**
Search for a possible strangeness S = -2 dibaryon, 9:3637 (RA;US)
**Production**
Search for a possible strangeness S = -2 dibaryon, 9:3637 (RA;US)

**XI NEUTRAL**
**Beam Production**
$XI^0$ experiments, 9:3693 (RA;US)
**Weak Particle Decay**
$XI^0$ experiments, 9:3693 (RA;US)

**XI PARTICLES**
*See also XI MINUS*
*XI NEUTRAL*
**Bound State**
Search for strange dibaryons at KEK and LAMPF II, 9:3638 (RA;US)
**Energy-Level Transitions**
Electromagnetic decays of hyperon-excited states, 9:3769 (RA;US)

**X-RAY EMISSION ANALYSIS**
*See also X-RAY FLUORESCENCE ANALYSIS*
**Muon Beams**
Surface studies with muons, 9:2890 (RA;US)

**X-RAY EQUIPMENT**
**Radiation Protection**
Order No. 571 of 7 December 1981 on apparatus used for X-ray analysis (Denmark), 9:4262 (R;DK;In Danish)

**X-RAY FLUORESCENCE ANALYSIS**
**Operation**
Installation and commissioning of a Siemens SRS200 sequential X-ray-fluorescence spectrometer, 9:3208 (R;ZA)
**Performance**
Installation and commissioning of a Siemens SRS200 sequential X-ray-fluorescence spectrometer, 9:3208 (R;ZA)

**X-RAY SPECTROMETERS**
**Design**
Imaging x-ray spectrometer for laser fusion applications, 9:4138 (J;US)
Pulsed plasma source spectrometry in the 80—8000-eV x-ray region, 9:4096 (J;US)
**Fabrication**
100-microsecond-resolved EXAFS technique for studying protein dynamics, 9:3212 (J;US)
Imaging x-ray spectrometer for laser fusion applications, 9:4138 (J;US)
**Feasibility Studies**
100-microsecond-resolved EXAFS technique for studying protein dynamics, 9:3212 (J;US)

**Sensitivity**
Imaging x-ray spectrometer for laser fusion applications, 9:4138 (J;US)
**X-Ray Spectroscopy**
100-microsecond-resolved EXAFS technique for studying protein dynamics, 9:3212 (J;US)
**X-RAY SPECTROSCOPY**
**Synchrotron Radiation**
Basic assumptions and recent developments in quantitative XPS, 9:2905 (J;GB)
**XYLOSE**
**Fermentation**
Value of furfural/ethanol coproduction from acid hydrolysis processes, 9:2084 (R;US)

## Y

**YANG-MILLS THEORY**
**Commutation Relations**
Equal-time commutation relations for non-abelian gauge field theories and Dirac brackets, 9:4005 (R;BR)
**Duality**
Surface terms and dual formulations of gauge theories, 9:3826 (R;XA)
**Effective Charge**
Some results of the summation of constant sign asymptotic series of perturbation theory, 9:4009 (RA;SU;In Russian)
**Perturbation Theory**
Some results of the summation of constant sign asymptotic series of perturbation theory, 9:4009 (RA;SU;In Russian)
**YEASTS**
**Biochemistry**
Lipid-enhanced ethanol production by Kluyveromyces fragilis, 9:2128 (J;US)
**YEELIRRIE DEPOSIT**
**Exploitation**
Uranium (Yeelirrie) Agreement Act, 1978 - No. 110 of 1978, 9:1909 (R;AU)
Uranium (Yeelirrie) Agreement Act 1982 - No. 40 of 1982, 9:1910 (R;AU)
**Y*RESONANCES**
**Particle Production**
Existence of Ξ resonances above 2 GeV, 9:3721 (J;US)
**YTTERBIUM 152**
**Energy-Level Transitions**
Spherical, oblate, and prolate nuclear shapes near $^{148}$Gd, 9:3914 (J;US)
**YTTERBIUM IONS**
**Energy-Level Transitions**
$3p^6\,3d^9$-$3p^5\,3d^{10}$ transitions in cobaltlike ions from $Ba^{29+}$ to $Yb^{43+}$, 9:3591 (J;US)
**YTTRIUM**
**Neutron Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**Proton Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**YTTRIUM 101**
**Rotational States**
Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A∼100 region, 9:3912 (J;US)
**YTTRIUM 99**
**Rotational States**
Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A∼100 region, 9:3912 (J;US)
**YTTRIUM ALLOYS**
**Phase Studies**
Example of the use of combined techniques of analytical transmission electron microscopy for phase identification (Ti-8Al-4Y), 9:2749 (BA;US)
**YTTRIUM ALUMINIUM GARNETS**
*See ALUMINIUM OXIDES*
**YTTRIUM BORIDES**
**Critical Field**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**Superconductivity**
Unusual critical-field behavior in Y/sub 1-x/Er/sub x/$Rh_4B_4$, 9:2783 (J;US)
**YTTRIUM CARBIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Structural Chemical Analysis**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**YTTRIUM CHLORIDES**
**Chemical Reaction Yield**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**Chemical Reactions**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**YTTRIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**S States**
Revised $3p^6 3d^8\ ^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3560 (J;US)
**YTTRIUM ISOTOPES**
*See also YTTRIUM 101*
*YTTRIUM 99*
**Delayed Neutron Precursors**
Delayed neutron precursors at masses 97—99 and 146—148, 9:3910 (J;US)
**YTTRIUM OXIDES**
**Chemical Reactions**
Interstitial and intercalation chemistry of the double-metal-layered yttrium monochloride, 9:2921 (J;US)
**YTTRIUM SULFIDES**
**Phonons**
Lattice dynamics of the intermediate valence compounds Sm/sub 0.75/Y/sub 0.25/S and TmSe, 9:2871 (BA;NL)
**YUGOSLAVIA R-A REACTOR VINCA**
*See R-A REACTOR*

## Z

**Z PINCH DEVICES (LINEAR)**
*See LINEAR Z PINCH DEVICES*
**ZEOLITES**
**Calcination**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Decomposition**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Dehydration**
High-resolution silicon-29 nuclear magnetic resonance and neutron powder diffraction study of Na-A zeolite. Loewenstein's rule vindicated. 9:2928 (J;US)
**Sorptive Properties**
Effect of preparation methods on the catalytic properties of zeolite-supported ruthenium in the Fischer-Tropsch synthesis, 9:2081 (J;US)
**Structural Chemical Analysis**
High-resolution silicon-29 nuclear magnetic resonance and neutron powder diffraction study of Na-A zeolite. Loewenstein's rule vindicated, 9:2928 (J;US)

ZERO POWER REACTORS
*See also KUCA REACTOR*
Construction
A program of hands-on training in the operation of a critical assembly facility, 9:2391 (J;US)
Design
A program of hands-on training in the operation of a critical assembly facility, 9:2391 (J;US)
Educational Facilities
A program of hands-on training in the operation of a critical assembly facility, 9:2391 (J;US)
Experience with hands-on training at the Los Alamos critical assemblies facility, 9:2392 (J;US)
Gamma Dosimetry
Neutron and gamma-ray measurements on the LANL Little Boy Comet Assembly, 9:2390 (R;US)
Neutron Dosimetry
Neutron and gamma-ray measurements on the LANL Little Boy Comet Assembly, 9:2390 (R;US)
Training
Experience with hands-on training at the Los Alamos critical assemblies facility, 9:2392 (J;US)
ZINC
Biological Accumulation
Heavy metal and sulphur concentrations in Sphagnum magellanicum Brid. in the Maritime Provinces, Canada, 9:3415 (J;NL)
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
Charged-Particle Transport
Distributions of accelerated ion ranges. Helium and lithium isotopes, 9:3961 (R;SU;In Russian)
Ecological Concentration
Heavy metal and arsenic concentrations of a woodland moss Hylocomium splendens (Hedw.) Br. et Sch. growing around a coal-fired power plant in coastal southern Finland, 9:3409 (R;SE)
Trace element concentrations in different trophic levels near the site of a future coal-fired power plant and related facilities, 9:3282 (RA;US)
Physical Radiation Effects
Investigation of lattice defects in zinc after proton and electron irradiation, 9:2699 (R;DE;In German)
Surface Energy
Surface energy of zinc, 9:2723 (J;US)
Uptake
Zinc and cadmium in lettuce and radish grown in soils collected near electrical transmission (hydro) towers, 9:3416 (J;NL)
ZINC 64 TARGET
Alpha Reactions
Level structure of $^{67}$Ge and its implications for the general structure of nuclei in the 1f-2p shell, 9:3890 (J;US)
ZINC 65
Tissue Distribution
Biological elimination rates of radioisotopes by mallards contaminated at a liquid radioactive waste disposal area, 9:3393 (J;GB)
ZINC 70 TARGET
Carbon 14 Reactions
Complementary investigation of neutron-rich exotic nuclei in the region of Fe, Ni and Zn, 9:3893 (R;FR)
ZINC ALLOYS
Ferromagnetism
Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/Cu/sub x/ and ZrZn/sub 1.9/, 9:2758 (J;GB)
ZINC CHLORIDES
Catalytic Effects
Systematic chemical-catalytic study of coal structure under subsoftening conditions, 9:1780 (D;US)
ZINC COMPLEXES
Physico-chemical investigation of some areas of fundamental significance to biophysics. Annual report, 1982-1983, 9:3001 (R;US)
ZINC FLUORIDES
Crystal-Phase Transformations
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/F$_2$, 9:2854 (J;US)
Ising Model
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/F$_2$, 9:2854 (J;US)
Neutron Diffraction
Random fields and three-dimensional Ising models: Co/sub x/Zn/sub 1-x/F$_2$, 9:2854 (J;US)
ZINC IONS
Energy Levels
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
Oscillator Strengths
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
ZINC OXIDES
Annealing
Rutherford backscattering evidence for solid phase laser annealing of Corning 7059 glass and ZnO thin films, 9:2866 (J;US)
Catalytic Effects
Catalytic decomposition of gaseous $SO_3$, 9:2927 (J;US)
Sorptive Properties
Investigation of adsorption and catalytic decomposition of the systems ethanol on ZnO and $H_2/H_2O$ on ZnO/GaAs, 9:2911 (R;DE;In German)
ZINC PHOSPHIDES
Deposition
Deposition and properties of zinc phosphide films, 9:2865 (J;US)
Electric Conductivity
Deposition and properties of zinc phosphide films, 9:2865 (J;US)
ZINC SELENIDES
Impurities
Extended x-ray absorption fine structure studies of diffused copper impurities in ZnSe, 9:2838 (J;US)
ZINC SULFATES
Response Modifying Factors
Study of radio-restoration by various mineral salts and silica rich products (Tuf and Pouzzolane) of rice embryos (Oryza-sativa L, Cigalon variety) exposed to cobalt 60 gamma rays, 9:3387 (R;FR;In French)
ZINC TELLURIDES
Optical Dispersion
Dispersion of the refractive index of InP and ZnTe, 9:2864 (J;US)
Refractivity
Dispersion of the refractive index of InP and ZnTe, 9:2864 (J;US)
ZIRCALOY
*For unspecified Zircaloy alloys.*
*See also ZIRCALOY 4*
Creep
Effects of temperature and pressure on the in-reactor creepdown of Zircaloy fuel cladding, 9:2745 (J;US)
ZIRCALOY 4
Oxidation
Layer structures of oxide scales on zircaloy-4 tube exposed to steam-hydrogen mixture at high temperatures, 9:2333 (R;JP;In Japanese)
ZIRCONIUM
Binding Energy
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)
Photoionization
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)
Photon-Atom Collisions
Optogalvanic response to light: photon energy vs photon number; comments, 9:3594 (J;US)

**Physical Radiation Effects**
Defect production rates in ion-irradiated metals, 9:4174 (RA;JP;In Japanese)
Trapping-detrapping phenomena of hydrogen, helium and their isotopes into or from materials, 9:4166 (RA;JP;In Japanese)
**Proton Reactions**
Estimation of neutron-induced spallation yields of krypton isotopes, 9:3896 (J;US)
**Spectral Shift**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)

**ZIRCONIUM 101**
**Rotational States**
Rotational structure and Nilsson orbitals for highly deformed odd-A nuclei in the A~100 region, 9:3912 (J;US)

**ZIRCONIUM 90**
**Nuclear Structure**
Gamow-Teller strength function for $^{90}$Zr: Effects of spin and isospin exchange forces, and ground-state correlations, 9:3913 (J;US)

**ZIRCONIUM 90 TARGET**
**Pion Minus Reactions**
Dependence of the excitation energy, width, and cross section of the isovector monopole resonance, 9:3908 (R;US)
**Pion Plus Reactions**
Isobaric analog states in pion single-charge-exchange reactions on and above the (3,3) resonance energy, 9:3875 (J;US)

**ZIRCONIUM 95**
**Uptake**
Uptake of γ-emitting radionuclides by soils placed in test reactor leaching ponds, 9:3330 (RA;US)

**ZIRCONIUM ALLOYS**
**Crystal Structure**
Deuterium site occupation in the oxygen-stabilized eta-carbides Zr3V3OD/sub x/. I. Preparation and neutron powder diffraction, 9:2709 (J;US)
Deuterium site occupation in the oxygen-stabilized eta-carbides Zr3V3OD/sub x/. II. Application of a geometric model, 9:2710 (J;US)
**Ferromagnetism**
Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/, 9:2758 (J;GB)
**Inhibition**
Hydrogen effect on the itinerant ferromagnets TiBe/sub 2-x/ Cu/sub x/ and ZrZn/sub 1.9/, 9:2758 (J;GB)
**Physical Radiation Effects**
Dimensional changes in cold-worked Zr-2.5 wt% Nb pressure tubes in CANDU reactors, 9:2272 (J;US)
Preliminary small angle neutron scattering investigations of neutron irradiation produced voids, 9:2770 (BA;US)

**ZIRCONIUM BROMIDES**
**Binding Energy**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)
**Spectral Shift**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)

**ZIRCONIUM CHLORIDES**
**Binding Energy**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)
**Spectral Shift**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)

**ZIRCONIUM HYDRIDES**
**Binding Energy**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)
**Physical Radiation Effects**
Trapping-detrapping phenomena of hydrogen, helium and their isotopes into or from materials, 9:4166 (RA;JP;In Japanese)
**Spectral Shift**
Core photoelectron shifts in reduced zirconium halides. Relaxation effects and delocalized metal-metal bonding, 9:2929 (J;US)

**ZIRCONIUM IONS**
**Energy Levels**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**Oscillator Strengths**
Oscillator strengths and wavelengths for the copper and zinc isoelectronic sequences; Z = 29 to 42, 9:3592 (J;US)
**S States**
Revised $3p^6 3d^8\ {}^1S_0$ level of Sr XIII, Y XIV, Zr XV, Nb XVI, and Mo XVII, 9:3560 (J;US)

**ZIRCONIUM OXIDES**
**Photoelectron Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**Quantity Ratio**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)
**X-Ray Spectroscopy**
Contribution to the surface quantitative analysis by X-ray photo-electron spectroscopy (XPS), 9:2776 (RA;BR;In Spanish)

**ZOOPLANKTON**
**Radiation Monitoring**
Transuranium nuclides in pelagic and benthic components of test reactor leaching ponds, 9:3329 (RA;US)

## NOTICE

During the preparation of *ERA*, Volume 9, Number 2, an error was introduced that resulted in the abstract numbers on all entries in the Subject and Contract Number Indexes being six digits too low. The error arose when the initial abstract number 1751 was used instead of the correct number 1757.

I regret the inconvenience to the users of *ERA* and will eliminate the error from our file prior to preparation of the cumulative indexes.

David E. Bost

David E. Bost
Editor

# CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which documents announced in this publication were prepared are included in this index.


| *Contract No.* | *Abstract No.* | *Report No.* |
|---|---|---|
| **AC01-77EI08607** | **Wharton (E.F.A.), Inc., Philadelphia, PA (USA)** | |
| | 9:2531 | DOE/EI/08607—T1 |
| **AC01-77ET10612** | **Lewin and Associates, Inc., Washington, DC (USA)** | |
| | 9:1820 | DOE/ET/10612—T1 |
| **AC01-77ET29033** | **Systems Control, Inc., Burlington, MA (USA)** | |
| | 9:2561 | DOE/ET/29033—1 |
| **AC01-78ET29034** | **Honeywell, Inc., Minneapolis, MN (USA). Systems and Research Center** | |
| | 9:2562 | DOE/ET/29034—1 |
| **AC01-79CR10004** | **General Research Corp., Santa Barbara, CA (USA)** | |
| | 9:1752 | DOE/CR/10004—1 |
| **AC01-79CS20524** | **Winter (Steven) Associates, Inc., New York (USA)** | |
| | 9:2606 | DOE/CS/20524—1-Draft |
| | 9:2607 | DOE/CS/20524—2-Draft |
| | 9:2608 | DOE/CS/20524—4-Draft |
| | 9:2609 | DOE/CS/20524—5-Draft |
| **AC01-81CS50007** | **Bonner and Moore Management Science, Houston, TX (USA)** | |
| | 9:2641 | DOE/CS/50007—T2 |
| **AC01-82CE15095** | **National Center for Appropriate Technology, Butte, MT (USA)** | |
| | 9:2130 | DOE/CE/15095—5 |
| **AC01-83EP16004** | **NUS Corp., Gaithersburg, MD (USA)** | |
| | 9:4234 | DOE/EP/16004—T1 |
| **AC02-76CH00016** | **Department of Energy and Environment, Brookhaven National Laboratory, Associated Universities, Inc.,** | |
| | 9:2147 | Energy (Oxford) 7 NO. 8. 689-703 (Aug 1982). |
| | **Brookhaven National Lab., Upton, NY (USA)** | |
| | 9:2215 | BNL-NUREG—33657 |
| | 9:2397 | BNL-NUREG—33665 |
| | 9:2654 | BNL—33700-Summ. |
| | 9:2750 | BNL-tr—1008(1982). |
| | 9:2790 | Surface Science NO. 113. 544-549 (1982). |
| | 9:2831 | Applied Physics Letters 43 NO. 11. 1045-1047 (1 Dec 1983). |
| | 9:2853 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2535-2546 (1 Sep 1983). |
| | 9:2858 | Physical Review Letters 51 NO. 8. 654-657 (22 Aug 1983). |
| | 9:2860 | Journal of Low Temperature Physics 52 NO. 3. 289-300 (1 Aug 1983). |
| | 9:2882 | BNL—33706 |
| | 9:2883 | BNL—33840 |
| | 9:2928 | Journal of Physical Chemistry 87 NO. 19. 3783-3790 (15 Sep 1983). |
| | 9:2992 | Journal of the American Chemical Society 105 NO. 5. 1387-1389 (9 Mar 1983). |
| | 9:3162 | BNL—33859 |
| | 9:3419 | Applied and Environmental Microbiology 45 NO. 1. 238-247 (Jan 1983). |
| | **Brandeis Univ., Waltham, MA (USA). Dept. of Physics** | |
| | 9:3508 | BNL—33685 |
| | 9:3609 | Physics Today 36 NO. 5. 35-43 (May 1983). |
| | **Brookhaven National Lab., Upton, NY (USA)** | |
| | 9:3610 | BNL—33677 |
| | 9:3787 | Annals of Physics (New York) 148 NO. 2. 381-435 (Jul 1983). |
| | 9:3844 | Physical Review [Section] D: Particles and Fields 28 NO. 8. 2101-2103 (15 Oct 1983). |
| | 9:3859 | Nuclear Data Sheets 37 NO. 4. 595-717 (Dec 1982). |
| | 9:3950 | Physical Review [Section] C: Nuclear Physics 28 NO. 4. 1798-1806 (Oct 1983). |
| | 9:3986 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2883-2885 (1 Sep 1983). |
| | 9:3991 | Journal of Physics C: Solid State Physics 14 L171-L176 (1981). |
| | 9:4230 | BNL—33767 |
| | 9:4231 | BNL—33772 |
| **AC02-76CH03000** | **Fermi National Accelerator Laboratory, Batavia, Illinois 60510** | |
| | 9:3723 | Physical Review Letters 51 NO. 10. 863-866 (5 Sep 1983). |
| **AC02-76CH03073** | **Department of Physics, Auburn University, Auburn, Alabama 36849** | |
| | 9:3210 | American Journal of Physics 51 NO. 11. 1031-1036 (Nov 1983). |
| | 9:4081 | Physics of Fluids 26 NO. 11. 3292-3299 (Nov 1983). |
| | 9:4106 | Physics of Fluids 26 NO. 10. 3070-3078 (Oct 1983). |
| | 9:4110 | Physics of Fluids 26 NO. 10. 2772-2774 (Oct 1983). |
| | 9:4111 | Physics of Fluids 26 NO. 10. 2958-2965 (Oct 1983). |
| | 9:4113 | Physics of Fluids 26 NO. 10. 3038-3052 (Oct 1983). |
| | 9:4114 | Physics of Fluids 26 NO. 10. 3066-3069 (Oct 1983). |
| | 9:4194 | Physics of Fluids 26 NO. 11. 3167-3169 (Nov 1983). |
| **AC02-76CS32586** | **E.I. du Pont de Nemours Co. Inc., Aiken, SC** | |
| | 9:2969 | Journal of Materials Science 16 2171-2725 (1981). |
| **AC02-76ER00881** | **University of Helsinki, Research Institute for Theoretical Physics, SF-00170 Helsinki 17, Finland** | |
| | 9:3781 | Physical Review Letters 51 NO. 10. 857-858 (5 Sep 1983). |
| | 9:3841 | American Journal of Physics 51 NO. 11. 1042-1043 (Nov 1983). |
| **AC02-76ER01198** | **Univ. of Illinois at Urbana-Champaign** | |
| | 9:2756 | Surface Science 106 382-396 (1981). |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| | 9:2767 | TMS (The Metallurgical Society) Paper Selection 18-47 (1977). |
| | 9:2803 | Physical Review [Section] B: Condensed Matter 28 NO. 6. 3559-3560 (15 Sep 1983). |
| | 9:2875 | Journal of Non-Crystalline Solids 46 437-440 (1981). |
| | 9:3196 | Review of Scientific Instruments 54 NO. 10. 1413-1414 (Oct 1983). |
| | 9:3606 | Journal of Low Temperature Physics 52 NO. 1. 15-40 (1 Jul 1983). |
| **AC02-76ER01591** | **Univ. of Utah, Salt Lake City** | |
| | 9:2799 | Journal of Materials Science 14 2163-2171 (1979). |
| **AC02-76ER01713** | **Washington Univ., St. Louis, MO (USA). Dept. of Chemistry** | |
| | 9:2908 | DOE/ER/01713—T2 |
| **AC02-76ER02220** | **The Institute for Advanced Study, Princeton, New Jersey 08540** | |
| | 9:3472 | Physical Review Letters 51 NO. 11. 1007-1009 (12 Sep 1983). |
| | 9:3815 | Physical Review Letters 51 NO. 12. 1026-1029 (19 Sep 1983). |
| **AC02-76ER02313** | **Colorado School of Mines, Golden (USA)** | |
| | 9:2674 | DOE/ER/02313—13 |
| **AC02-76ER02853** | **Masssachusetts Univ., Amherst (USA). Dept. of Physics and Astronomy** | |
| | 9:3898 | DOE/ER/02853—20 |
| **AC02-76ER02887** | **Harvard Coll. Observatory, Cambridge, MA (USA)** | |
| | 9:3509 | DOE/ER/02887—T1 |
| | 9:3592 | Atomic Data and Nuclear Data Tables 28 NO. 1. 107-214 (Jan 1983). |
| **AC02-76ER02944** | **Wright State Univ., Dayton, OH** | |
| | 9:2978 | Journal of Physical Chemistry 87 NO. 19. 3732-3735 (15 Sep 1983). |
| **AC02-76ER02995** | **Arizona State Univ., Tempe** | |
| | 9:2798 | Scanning Electron Microscopy 1 390-391 (1980). |
| | 9:3218 | Scanning Electron Microscopy 3 176-177 (1980). |
| **AC02-76ER03069** | **Center for Theoretical Physics, Laboratory for Nuclear Science, Massachusetts Institute of Technolog** | |
| | 9:3876 | Physical Review [Section] C: Nuclear Physics 28 NO. 4. 1565-1569 (Oct 1983). |
| **AC02-76ER03074** | **A. W. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06511** | |
| | 9:3850 | Annals of Physics (New York) 148 NO. 2. 346-380 (Jul 1983). |
| | 9:3928 | Physical Review Letters 51 NO. 8. 646-649 (22 Aug 1983). |
| **AC02-76ER03077** | **Courant Institute of Mathematical Sciences, New York University, 251 Mercer Street, New York, New Yo** | |
| | 9:4025 | Journal of Statistical Physics 32 NO. 2. 389-405 (Aug 1983). |
| **AC02-76ER03227** | **Univ. of Utrecht, Netherlands** | |
| | 9:4034 | Physica A (Amsterdam) 113 401-416 (1982). |
| **AC02-76ER03230** | **Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138** | |
| | 9:3473 | Physical Review Letters 51 NO. 10. 931-934 (5 Sep 1983). |
| **AC02-76ER03533** | **Physics Department, Syracuse University, Syracuse, New York 13210** | |
| | 9:3784 | Physical Review Letters 51 NO. 8. 631-633 (22 Aug 1983). |
| **AC02-76ER13001** | **Department of Physics, University of Stockholm** | |
| | 9:3474 | Astrophysical Journal 272 NO. 1. 311-316 (1 Sep 1983). |
| | 9:3601 | Journal of Low Temperature Physics 52 NO. 5. 379-408 (1 Sep 1983). |
| | 9:3783 | Physical Review Letters 51 NO. 9. 747-750 (29 Aug 1983). |
| | 9:3816 | Physical Review Letters 51 NO. 9. 751-754 (29 Aug 1983). |
| **AC02-76ET53016** | **Bell Laboratories, Murray Hill, New Jersey 07974** | |
| | 9:4100 | Physics of Fluids 26 NO. 10. 2770-2772 (Oct 1983). |
| | 9:4118 | Physical Review Letters 51 NO. 11. 992-995 (12 Sep 1983). |
| **AC02-76ET53017** | **Department of Applied Physics, Cornell University, Ithaca, New York 14853** | |
| | 9:4095 | Physics of Fluids 26 NO. 10. 3092-3095 (Oct 1983). |
| **AC02-76EV00119** | **Univ. of Utah, Salt Lake City** | |
| | 9:3398 | Radiation Research 94 NO. 1. 210-216 (Apr 1983). |
| **AC02-76EV01340** | **Department of Atmospheric Sciences, Colorado State University, Fort Collins, Colorado 80523** | |
| | 9:3254 | Journal of the Atmospheric Sciences 40 NO. 7. 1631-1658 (Jul 1983). |
| **AC02-76EV01599** | **Michigan State Univ., Hickory Corners** | |
| | 9:3323 | Ecology 63 NO. 6. 1729-1739 (Dec 1982). |
| **AC02-76EV02185** | **Lamont-Doherty Geological Observatory of Columbia Univ., Palisades, NY** | |
| | 9:3334 | Geochimica et Cosmochimica Acta 47 NO. 2. 201-210 (Feb 1983). |
| **AC02-76EV03490** | **Univ. of Rochester School of Medicine and Dentistry, NY** | |
| | 9:3400 | American Industrial Hygiene Association Journal 44 NO. 4. 306-309 (1983). |
| **AC02-77CH00178** | **Solar Energy Research Inst., Golden, CO (USA)** | |
| | 9:2084 | SERI/TR—231-2000 |
| | 9:2120 | SERI/PR—02085-1-T2 |
| | 9:2121 | SERI/PR—02085-1-T3 |
| | **Rockwell International Corp., Thousand Oaks, CA (USA). Microelectronics Research and Development Center** | |
| | 9:2122 | SERI/TR—8058-2-T5 |
| | 9:2123 | SERI/TR—9002-2-T1 |
| | **Solar Energy Research Inst., Golden, CO (USA)** | |
| | 9:2144 | SERI/TR—253-1906 |
| | 9:2176 | SERI/TR—252-1765 |
| | 9:2180 | SERI/TP—215-2009 |
| **AC02-77CS20050** | **Colorado Univ., Boulder (USA). Inst. of Behavioral Sciences** | |
| | 9:2603 | DOE/CS/20050—1 |
| **AC02-77CS20062** | **Princeton Univ., NJ** | |
| | 9:2629 | Environment International 8 NO. 1-6. 453-459 (1982). |
| **AC02-77ER04254** | **Northwestern Univ., Evanston, IL** | |
| | 9:2946 | Journal of Catalysis 80 NO. 2. 479-481 (Apr 1983). |
| **AC02-77ET37201** | **Westinghouse Electric Corp., Pensacola, FL (USA). Nuclear Components Div.** | |
| | 9:2275 | CONF-831111—10 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| **AC02-77ET52017** | **ECON, Inc., Princeton, NJ (USA)** | |
| | 9:4149 | DOE/ET/52017—T1 |
| **AC02-77ET53001** | **Arizona Univ., Tucson (USA)** | |
| | 9:4046 | DOE/ET/53001—4 |
| **AC02-77ET53068** | **American Science and Engineering, Incorporated, Cambridge, Massachusetts 02139** | |
| | 9:4136 | Physical Review Letters 49 NO. 25. 1826-1829 (20 Dec 1982). |
| **AC02-77EV04472** | **Case Western Reserve Univ., Cleveland, OH (USA)** | |
| | 9:3386 | DOE/EV/04472—T3 |
| **AC02-78ER04939** | **The authors are with Purdue University, School of Mechanical Engineering, West Lafayette, Indiana 47** | |
| | 9:3052 | Applied Optics 21 NO. 20. 3729-3735 (15 Oct 1982). |
| **AC02-78ER04991** | **Baker Laboratory of Chemistry, Cornell University, Ithaca, New York 14853** | |
| | 9:3215 | Review of Scientific Instruments 54 NO. 10. 1416-1417 (Oct 1983). |
| **AC02-78ER05016** | **Brigham Young Univ., Provo, UT** | |
| | 9:2903 | Journal of the American Chemical Society 105 NO. 7. 1782-1785 (6 Apr 1983). |
| | 9:2904 | Journal of the American Chemical Society 105 NO. 7. 1785-1790 (6 Apr 1983). |
| **AC02-78ET34212** | **Babcock and Wilcox Co., Lynchburg, VA (USA)** | |
| | 9:2217 | DOE/ET/34212—40 |
| **AC02-78ET51013** | **Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center** | |
| | 9:4045 | DOE/ET/51013—100 |
| | 9:4104 | Physics of Fluids 26 NO. 10. 2992-3003 (Oct 1983). |
| **AC02-79CS20271** | **Tishman Research Corp., New York (USA)** | |
| | 9:2605 | DOE/CS/20271—2 |
| **AC02-79ER10366** | **Univ. of Colorado, Boulder** | |
| | 9:3017 | Journal of the American Chemical Society 105 NO. 5. 1218-1220 (9 Mar 1983). |
| **AC02-79ER10425** | **Univ. of Minnesota, Minneapolis** | |
| | 9:2931 | Journal of Physical Chemistry 87 NO. 18. 3415-3419 (1 Sep 1983). |
| **AC02-79ER10444** | **Department of Physics, Boston University, Boston, Massachusetts 02215** | |
| | 9:2842 | Journal of Applied Physics 54 NO. 10. 5945-5949 (Oct 1983). |
| | 9:2864 | Journal of Applied Physics 54 NO. 4. 2030-2035 (Apr 1983). |
| **AC02-79ER10453** | **Rensselaer Polytechnic Institute, Troy, New York 12181** | |
| | 9:2870 | Journal of the American Ceramic Society 65 NO. 9. 407-410 (Sep 1982). |
| **AC02-79ET34006** | **Exxon Nuclear Co., Inc., Richland, WA (USA)** | |
| | 9:2195 | DOE/ET/34006—9 |
| **AC02-79ET34020** | **Babcock and Wilcox Co., Lynchburg, VA (USA). Utility Power Generation Div.** | |
| | 9:2216 | DOE/ET/34020—4 |
| **AC02-80ER10559** | **Institute of Applied Chemical Physics, The City College of The City University of New York, New York** | |
| | 9:3985 | Physics of Fluids 26 NO. 11. 3159-3161 (Nov 1983). |
| **AC02-80ER10570** | **Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering** | |
| | 9:2675 | DOE/ER/10570—T2 |
| **AC02-80ER10581** | **Rockefeller Univ., New York (USA)** | |
| | 9:3344 | DOE/ER/10581—T2 |
| **AC02-80ER10591** | **School of Nuclear Engineering, Purdue University, West Lafayette, IN 47907** | |
| | 9:2728 | Acta Metallurgica 31 NO. 3. 453-464 (Mar 1983). |
| **AC02-80ER10592** | **Univ. of Minnesota, Minneapolis** | |
| | 9:3013 | Journal of Physical Chemistry 87 NO. 17. 3207-3212 (18 Aug 1983). |
| | 9:3020 | Journal of the American Chemical Society 105 NO. 5. 1126-1129 (9 Mar 1983). |
| **AC02-80ER10597** | **Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering** | |
| | 9:2518 | DOE/ER/10597—2 |
| **AC02-80ER10612** | **State Univ. of New York, Stony Brook (USA). Dept. of Chemistry** | |
| | 9:2971 | DOE/ER/10612—9 |
| **AC02-80ER10663** | **Department of Physics, University of Arizona, Tucson, Arizona 85721** | |
| | 9:3817 | Annals of Physics (New York) 148 NO. 2. 257-281 (Jul 1983). |
| **AC02-80ER10735** | **Goodrich (B.F.) Co., Akron, OH (USA)** | |
| | 9:2801 | CONF-830104—6 |
| | 9:2802 | CONF-8111188—1 |
| **AC02-80ER10755** | **Wisconsin Univ., Madison (USA)** | |
| | 9:2999 | DOE/ER/10755—3 |
| **AC02-80ER10773** | **Astronomy and Astrophysics Center, University of Chicago** | |
| | 9:3480 | Astrophysical Journal, Letters to the Editor 270 NO. 2. L31-L33 (15 Jul 1983). |
| | 9:3486 | Physical Review Letters 49 NO. 25. 1873-1876 (20 Dec 1982). |
| | 9:3488 | Astrophysical Journal 262 NO. 2. 424-431 (15 Nov 1982). |
| **AC02-80ER53104** | **Nuclear Engineering Department, University of Wisconsin-Madison, Madison, Wisconsin 53706** | |
| | 9:4087 | Physics of Fluids 26 NO. 11. 3315-3326 (Nov 1983). |
| **AC02-80ET34072** | **Science Applications, Inc., Palo Alto, CA (USA)** | |
| | 9:2309 | DOE/ET/34072—2 |
| **AC02-80ET37249** | **Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Metallurgy and Materials Science** | |
| | 9:2678 | DOE/ET/37249—1 |
| **AC02-81ER10811** | **Brown Univ., Providence, RI (USA)** | |
| | 9:3203 | DOE/ER/10811—83 |
| **AC02-81ER10911** | **Univ. of Massachusetts, Boston** | |
| | 9:2067 | Journal of the American Chemical Society 105 NO. 20. 6323-6324 (5 Oct 1983). |
| | 9:2780 | Journal of Physical Chemistry 87 NO. 18. 3366-3367 (1 Sep 1983). |
| | 9:2956 | Journal of Physical Chemistry 87 NO. 5. 781-788 (3 Mar 1983). |
| **AC02-81ER10956** | **Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering** | |
| | 9:2676 | DOE/ER/10956—6 |
| | **Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.). Inst. fuer Werkstoffwissenschaften** | |
| | 9:2774 | DOE/ER/10956—5 |
| **AC02-81ER40012** | **Pennsylvania Univ., Philadelphia (USA). Dept. of Physics** | |
| | 9:3166 | DOE/ER/40012—T1 |
| **AC02-81ER40025** | **Department of Physics, University of Colorado, Boulder, Colorado 80309** | |
| | 9:3717 | Physical Review Letters 51 NO. 12. 1022-1025 (19 Sep 1983). |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| **AC02-81ER40033** | **The Rockefeller University, New York, New York 10021** | |
| | 9:3780 | Physical Review Letters 51 NO. 11. 959-962 (12 Sep 1983). |
| **AC02-81EV10610** | **Department of Applied Science, New York University, New York 10003** | |
| | 9:3255 | Journal of the Atmospheric Sciences 40 NO. 7. 1659-1708 (Jul 1983). |
| **AC02-81EV10673** | **Yale University, P.O. Box 2159, New Haven, Connecticut 06520** | |
| | 9:3197 | Review of Scientific Instruments 54 NO. 10. 1397-1400 (Oct 1983). |
| **AC02-82CE30741** | **NAHB Research Foundation, Inc., Rockville, MD (USA)** | |
| | 9:2139 | DOE/CE/30741—T1 |
| **AC02-82ER12049** | **Indiana University, Bloomington, Indiana 47405** | |
| | 9:3605 | Physical Review Letters 51 NO. 8. 617-620 (22 Aug 1983). |
| **AC02-82ER53136** | **University of Iowa, Iowa City, Iowa 52242** | |
| | 9:4102 | Physics of Fluids 26 NO. 10. 3008-3017 (Oct 1983). |
| **AC02-82ER53140** | **Grumman Aerospace Corp., Princeton, NJ (USA)** | |
| | 9:4042 | DOE/ER/53140—10 |
| **AC02-82ER60055** | **Pennsylvania State Univ., University Park (USA)** | |
| | 9:3258 | DOE/ER/60055—T1 |
| **AC02-82ER60076** | **Cincinnati Univ., OH (USA). Dept. of Environmental Health** | |
| | 9:3404 | DOE/ER/60076—1 |
| **AC02-83CH10093** | **Solar Energy Research Inst., Golden, CO (USA)** | |
| | 9:2143 | SERI/TP—255-2091 |
| | 9:2960 | DOE-tr—258(1983). |
| | 9:3085 | |
| **AC02-83ER40097** | **Cornell Univ., Ithaca, NY (USA). Ward Lab.** | |
| | 9:3899 | DOE/ER/40097—1 |
| **AC02-83ER45025** | **Arizona Univ., Tucson (USA)** | |
| | 9:2677 | DOE/ER/45025—2 |
| **AC03-76ET53057** | **Science Applications, Inc., Plasma Research Institute, Boulder, Colorado 80302** | |
| | 9:4107 | Physics of Fluids 26 NO. 10. 3079-3084 (Oct 1983). |
| **AC03-76SF00012** | **Univ. of California, Los Angeles** | |
| | 9:3298 | Health Physics 45 NO. 3. 643-650 (Sep 1983). |
| | 9:3382 | Ecology 63 NO. 6. 1650-1656 (Dec 1982). |
| **AC03-76SF00098** | **Lawrence Berkeley Lab., CA** | |
| | 9:2155 | Water Resources Research 19 NO. 1. 201-208 (Feb 1983). |
| | 9:2455 | Health Physics 45 NO. 3. 579-586 (Sep 1983). |
| | **Lawrence Berkeley Lab., CA (USA)** | |
| | 9:2520 | LBL—16523 |
| | 9:2567 | LBL—11531 |
| | 9:2727 | Acta Metallurgica 31 NO. 3. 379-388 (Mar 1983). |
| | 9:2845 | Physical Review Letters 51 NO. 12. 1089-1091 (19 Sep 1983). |
| | 9:2856 | Physical Review Letters 51 NO. 9. 778-781 (29 Aug 1983). |
| | 9:2902 | Physical Review [Section] A: General Physics 28 NO. 3. 1883-1885 (Sep 1983). |
| | 9:2909 | LBL—16569 |
| | 9:2926 | Journal of Physical Chemistry 87 NO. 19. 3629-3635 (15 Sep 1983). |
| | 9:2935 | Journal of Physical Chemistry 87 NO. 17. 3297-3300 (18 Aug 1983). |
| | 9:2959 | Inorganic Chemistry 22 NO. 4. 579-583 (16 Feb 1983). |
| | 9:2984 | Journal of the American Chemical Society 105 NO. 7. 1713-1716 (6 Apr 1983). |
| | 9:2985 | Journal of the American Chemical Society 105 NO. 7. 1760-1764 (6 Apr 1983). |
| | 9:3005 | Journal of Physical Chemistry 87 NO. 20. 3826-3829 (29 Sep 1983). |
| | 9:3008 | Journal of Physical Chemistry 87 NO. 19. 3638-3641 (15 Sep 1983). |
| | 9:3015 | Journal of the American Chemical Society 105 NO. 6. 1676-1677 (23 Mar 1983). |
| | 9:3125 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science 3 |
| | 9:3129 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science 3 |
| | 9:3205 | LBL—16694 |
| | 9:3436 | LBL—16259 |
| | 9:3471 | Physical Review Letters 51 NO. 12. 1099-1102 (19 Sep 1983). |
| | 9:3557 | Journal of Physical Chemistry 87 NO. 20. 3811-3819 (29 Sep 1983). |
| | 9:3729 | Physical Review Letters 51 NO. 8. 627-630 (22 Aug 1983). |
| | 9:4024 | Physical Review Letters 51 NO. 9. 775-777 (29 Aug 1983). |
| | 9:4099 | Review of Scientific Instruments 54 NO. 10. 1296-1299 (Oct 1983). |
| **AC03-76SF00515** | **Stanford Linear Accelerator Center, CA (USA)** | |
| | 9:3119 | CAPE—2881(16 Sep 1983). |
| | 9:3122 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Magnetics 19 NO. |
| | 9:3160 | CAPE—2882(27 Mar 1974). |
| | 9:3192 | SLAC-PUB—3235 |
| | 9:3193 | SLAC-PUB—3236 |
| | 9:3194 | SLAC-PUB—3237 |
| | 9:3707 | SLAC—262 |
| | 9:3708 | SLAC-PUB—3129 |
| | 9:3709 | SLAC-PUB—3202 |
| | 9:3711 | Physical Review Letters 51 NO. 13. 1135-1138 (26 Sep 1983). |
| | 9:3718 | Physical Review Letters 51 NO. 11. 955-958 (12 Sep 1983). |
| | 9:3720 | Physical Review Letters 51 NO. 11. 963-966 (12 Sep 1983). |
| | 9:3722 | Physical Review Letters 51 NO. 10. 859-862 (5 Sep 1983). |
| | 9:3771 | SLAC-PUB—3136 |
| | 9:3772 | SLAC-PUB—3219 |
| | 9:3773 | SLAC-PUB—3249 |
| **AC03-76SF01264** | **United Technologies Corp., South Windsor, CT (USA). Power Systems Div.** | |
| | 9:2585 | DOE/SF/01264—T1 |
| **AC03-77SF01326** | **Ecoview, Napa, CA (USA)** | |
| | 9:2162 | DOE/SF/01326—T6 |
| | **Geonomics, Inc., Berkeley, CA (USA)** | |
| | 9:2173 | DOE/SF/01326—T5 |
| **AC03-78ET13148** | **Peabody-Gordon-Piatt, Inc., Winfield, KS (USA)** | |
| | 9:2642 | DOE/ET/13148—2 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| **AC03-76ET27184** | **Science Applications, Inc., La Jolla, CA (USA)** | |
| | 9:2164 | DOE/ET/27184—T1 |
| **AC03-80CS24315** | **National Center for Resource Recovery, Inc., Washington, DC (USA)** | |
| | 9:2640 | DOE/CS/24315—20 |
| **AC03-81ER40009** | **Physics and Astronomy Department, San Francisco State University, San Francisco, California 94132** | |
| | 9:3724 | Physical Review Letters 51 NO. 9. 731-734 (29 Aug 1983). |
| **AC03-81ER53112** | **Aerospace Corp., Los Angeles, CA (USA). Electronics Research Lab.** | |
| | 9:4041 | DOE/ER/53112—T1 |
| **AC03-83ER53150** | **Science Applications, Inc., La Jolla, CA (USA)** | |
| | 9:4043 | DOE/ER/53150—T2 |
| **AC04-76DP00053** | **Monsanto Research Corp., Miamisburg, OH (USA). Mound** | |
| | 9:2895 | MLM—3112(OP) |
| | 9:3224 | MLM—3103 |
| **AC04-76DP00656** | **General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.** | |
| | 9:2065 | GEPP-TIS—761 |
| | 9:2794 | Journal of the American Ceramic Society 64 NO. 10. C136-C138 (Oct 1981). |
| **AC04-76DP00789** | **Earth Technology Corp., Houston, TX (USA)** | |
| | 9:1822 | SAND—83-7120 |
| | **Sandia National Labs., Albuquerque, NM (USA)** | |
| | 9:1891 | SAND—83-2137 |
| | 9:1908 | SAND—83-1214 |
| | 9:1934 | High Temperature Science 15 NO. 4. 327-329 (Dec 1982). |
| | 9:1938 | SAND—83-0866C |
| | 9:2066 | SAND—82-0998 |
| | **Acurex Corp., Mountain View, CA (USA)** | |
| | 9:2119 | SAND—83-7020 |
| | 9:2125 | Applied Physics Letters 42 NO. 7. 582-584 (1 Apr 1983). |
| | **Sandia National Labs., Albuquerque, NM (USA)** | |
| | 9:2140 | SAND—83-2074 |
| | **BDM Corp., Albuquerque, NM (USA)** | |
| | 9:2170 | SAND—83-7440 |
| | **Sandia National Labs., Albuquerque, NM (USA)** | |
| | 9:2445 | SAND—83-1829C |
| | 9:2446 | SAND—83-1851C |
| | 9:2447 | SAND—83-1852C |
| | 9:2448 | SAND—83-1881C |
| | 9:2449 | SAND—83-1890C |
| | 9:2450 | SAND—83-2080C |
| | 9:2451 | SAND—83-2245C |
| | 9:2452 | SAND—83-2251C |
| | 9:2453 | SAND—83-2252C |
| | **Sandia National Labs., Livermore, CA (USA)** | |
| | 9:2706 | SAND—83-8024 |
| | 9:2718 | Physical Review [Section] B: Condensed Matter 28 NO. 6. 3092-3099 (15 Sep 1983). |
| | 9:2732 | Physical Review [Section] B: Condensed Matter 27 NO. 2. 1363-1364 (15 Jan 1983). |
| | 9:2759 | Surface Science 105 129-144 (1981). |
| | **Sandia National Labs., Albuquerque, NM (USA)** | |
| | 9:2827 | SAND—83-0930C |
| | 9:2828 | SAND—83-1418C |
| | 9:2829 | SAND—83-2276C |
| | 9:2830 | Applied Physics Letters 43 NO. 11. 1020-1022 (1 Dec 1983). |
| | 9:2835 | Applied Physics Letters 43 NO. 10. 939-941 (15 Nov 1983). |
| | 9:2836 | Applied Physics Letters 43 NO. 10. 930-932 (15 Nov 1983). |
| | 9:2839 | Applied Physics Letters 43 NO. 9. 846-848 (1 Nov 1983). |
| | 9:2840 | Physical Review Letters 51 NO. 15. 1390-1393 (10 Oct 1983). |
| | 9:2873 | Journal of Physics and Chemistry of Solids 42 269-273 (1981). |
| | 9:2898 | SAND—83-2234C |
| | 9:3066 | SAND—83-2013C |
| | 9:3095 | SAND—83-1900 |
| | **New Mexico Univ., Albuquerque (USA)** | |
| | 9:3100 | SAND—83-2298C |
| | 9:3104 | Journal of Applied Physics 54 NO. 10. 6019-6025 (Oct 1983). |
| | **Sandia National Labs., Albuquerque, NM (USA)** | |
| | 9:3151 | SAND—83-0110 |
| | 9:3209 | SAND—83-2148C |
| | 9:3216 | Journal of Applied Physics 54 NO. 4. 1717-1722 (Apr 1983). |
| | 9:3566 | Atomic Data and Nuclear Data Tables 28 NO. 3. 381-460 (May 1983). |
| | 9:3965 | SAND—83-1409C |
| | 9:4243 | SAND—83-1401C |
| | 9:4244 | SAND—83-2164C |
| **AC04-76DP03533** | **Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant** | |
| | 9:1930 | RFP—3511 |
| | 9:2711 | RFP-Trans—416(Nov 1983). |
| | 9:2768 | |
| **AC04-78AL05346** | **Westinghouse Electric Corp., East Pittsburgh, PA (USA)** | |
| | 9:2001 | WIPP-DOE—171 |
| **AC05-76ET10143** | **Ashland Synthetic Fuels, Inc., KY (USA)** | |
| | 9:1753 | DOE/ET/10143—13 |
| | 9:1754 | DOE/ET/10143—19-Rev. |
| | 9:1755 | DOE/ET/10143—42 |
| **AC05-78ET20488** | **City Coll., New York (USA)** | |
| | 9:2175 | DOE/ET/20488—T1 |
| **AC06-76FF02170** | **Hanford Engineering Development Lab., Richland, WA (USA)** | |
| | 9:1922 | HEDL-TME—83-28 |
| | 9:1927 | HEDL-SA—2874 |
| | 9:2199 | HEDL-SA—2860-FP |
| | **Westinghouse Hanford Co., Richland, WA (USA)** | |
| | 9:2279 | HEDL-SA—2786 |
| | **Hanford Engineering Development Lab., Richland, WA (USA)** | |
| | 9:2332 | HEDL-SA—2858-FP |
| | 9:2337 | HEDL-SA—2829 |
| | 9:2377 | HEDL-SA—2755-FP |
| | 9:2407 | HEDL-SA—2835-FP |
| | 9:2408 | HEDL-SA—2839 |
| | 9:2409 | HEDL-SA—2884a |
| | 9:2682 | HEDL-SA—2909-FP |
| | 9:2683 | HEDL-SA—2912-FP |
| | 9:2684 | HEDL-SA—2913 |
| | 9:2685 | HEDL-SA—2982 |
| | 9:3088 | HEDL-SA—2984-FP |
| | 9:4154 | HEDL-SA—2987 |
| **AC06-76RL01830** | **Pacific Northwest Lab., Richland, WA (USA)** | |
| | 9:1811 | CONF-8110299—1 |
| | 9:1933 | High Temperature Science 15 NO. 4. 321-326 (Dec 1982). |
| | 9:1996 | PNL—4800 |
| | 9:1997 | PNL-SA—11136 |
| | 9:1998 | PNL-SA—11541 |
| | 9:2060 | PNL-SA—11441 |
| | 9:2080 | PNL-SA—11447 |
| | 9:2443 | PNL-SA—11214 |
| | 9:2444 | PNL-SA—11536 |
| | 9:2538 | PNL—4581-App.A-B |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| | 9:2624 | PNL—4179 |
| | 9:2788 | Journal of the American Ceramic Society 65 NO. 12. 589-593 (Dec 1982). |
| | 9:3038 | PNL—4903 |
| | 9:3274 | PNL—4822 |
| | 9:3391 | Health Physics 45 NO. 3. 617-629 (Sep 1983). |
| | 9:3396 | Radiation Research 94 NO. 1. 89-96 (Apr 1983). |
| | 9:3397 | Radiation Research 94 NO. 1. 199-209 (Apr 1983). |
| | 9:3399 | Radiation Research 94 NO. 1. 66-80 (Apr 1983). |
| | 9:3414 | PNL-SA—9942-Rev. |
| | **Colorado School of Mines, Golden (USA)** | |
| | 9:3435 | BMI/OCRD—4(5) |
| | 9:3910 | Physical Review [Section] C: Nuclear Physics 28 NO. 4. 1740-1751 (Oct 1983). |
| | **SRI International, Menlo Park, CA (USA)** | |
| | 9:4257 | PNL-SA—11539 |
| **AC06-77RL01030** | **Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations** | |
| | 9:1931 | RHO-PB-SR—10-B-CP-Sept.83 |
| **AC06-80ER53096** | **Mathematical Sciences Northwest, Inc., Bellevue, Washington 98004** | |
| | 9:4080 | Physics of Fluids 26 NO. 11. 3170-3172 (Nov 1983). |
| **AC06-81ER40048** | **Washington Univ., Seattle (USA). Nuclear Physics Lab.** | |
| | 9:3142 | DOE/ER/40048—77-L3 |
| | **Washington Univ., Seattle (USA). Inst. for Nuclear Theory** | |
| | 9:3735 | DOE/ER/40048—22-N3 |
| | **Washington Univ., Seattle (USA). Dept. of Physics** | |
| | 9:3885 | DOE/ER/40048—73-L3 |
| **AC07-76ID01570** | **EG and G Idaho, Inc., Idaho Falls (USA)** | |
| | 9:1943 | EGG-M—12383 |
| | 9:1944 | EGG-M—13283 |
| | 9:2083 | DOE/ID—10115 |
| | 9:2163 | EGG-M—14483 |
| | 9:2165 | EGG-M—11683 |
| | 9:2174 | EGG-M—11583 |
| | 9:2186 | IDO—10109 |
| | 9:2399 | CONF-830702—23 |
| | 9:2402 | EGG-M—07083 |
| | 9:2403 | EGG-M—08683 |
| | 9:2404 | EGG-M—24682 |
| | 9:2405 | EGG-M—27682 |
| | 9:2406 | EGG-PBS—6379 |
| | 9:2439 | NUREG/CR—3417 |
| | 9:2643 | EGG-M—03283 |
| | 9:4152 | EGG-FT—6392 |
| **AC08-76NV00410** | **Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)** | |
| | 9:2535 | DOE/NV/00410—80 |
| **AC08-80DP40124** | **University of Rochester, Laboratory for Laser Energetics, Rochester, New York 14623** | |
| | 9:3079 | Applied Optics 22 NO. 17. 2739-2742 (1 Sep 1983). |
| | 9:4116 | Physics of Fluids 26 NO. 10. 3107-3118 (Oct 1983). |
| **AC08-81DP40162** | **MPB Technologies, Inc., Dorval, Quebec H9P 1J1, Canada** | |
| | 9:4197 | Physics of Fluids 26 NO. 10. 3131-3137 (Oct 1983). |
| **AC08-81NV10162** | **Department of Energy, Las Vegas, NV (USA). Nevada Operations Office** | |
| | 9:1988 | NVO—266 |
| | 9:1989 | NVO—267 |
| | **Nevada Univ., Las Vegas (USA). Desert Research Inst.** | |
| | 9:2045 | NVO—268 |
| | 9:2046 | NVO—269 |
| **AC09-76SR00001** | **Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.** | |
| | 9:1942 | DP-MS—83-107 |
| | 9:2342 | DPST—71-590 |
| | 9:2401 | DPST—83-780 |
| | 9:2885 | DP-MS—83-31-Rev.1 |
| | **Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations** | |
| | 9:2886 | DP-MS—83-109 |
| | **Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.** | |
| | 9:3259 | DP-MS—83-14 |
| | **Environmental and Chemical Sciences, Inc., Aiken, SC (USA)** | |
| | 9:3336 | DPST—83-736-Vol.2 |
| **AC12-76SN00052** | **Knolls Atomic Power Lab., Schenectady, NY (USA)** | |
| | 9:2280 | KAPL—4154 |
| | 9:2281 | KAPL—4158 |
| | 9:2436 | KAPL—4156 |
| | 9:2437 | KAPL—4157 |
| **AC15-76CL50003** | **Westinghouse Electric Corp., Madison, PA (USA)** | |
| | 9:4233 | CONF-8309125—2 |
| **AC19-80BC10316** | **Petroleum Training and Technical Services, Norman, OK (USA)** | |
| | 9:1819 | DOE/BC/10316—26 |
| **AC20-82LC10962** | **Colorado School of Mines, Golden (USA). Excavation Engineering and Earth Mechanics Inst.** | |
| | 9:1901 | DOE/LC/10962—1 |
| **AC21-80ET14928** | **General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center** | |
| | 9:1751 | CONF-831199—1-PT.1 |
| **AC22-77ET10651** | **Chemical Engineering Department, University of Wyoming, Laramie, Wyoming 82071** | |
| | 9:2980 | Industrial and Engineering Chemistry Process Design and Development 22 NO. 3. 401-409 (Jul |
| **AC22-77ET11283** | **New York Univ., NY (USA). Dept. of Applied Science** | |
| | 9:2620 | NYU/DAS—80-20 |
| **AC22-79ET14879** | **State Univ. of New York, Binghamton** | |
| | 9:2901 | Journal of Organic Chemistry 48 NO. 18. 2963-2968 (9 Sep 1983). |
| **AC22-79ET15210** | **GA Technologies, Inc., San Diego, CA (USA)** | |
| | 9:2647 | GA-A—17109 |
| **AC22-79PC10318** | **Virginia Commonwealth Univ., Richmond** | |
| | 9:2918 | Journal of Catalysis 83 NO. 2. 454-463 (Oct 1983). |
| **AC22-80ET15602** | **FluiDyne Engineering Corp., Minneapolis, MN (USA)** | |
| | 9:2573 | DOE/ET/15602—T6 |
| **AC22-80ET15614** | **Avco-Everett Research Lab., Everett, MA (USA)** | |
| | 9:2574 | DOE/ET/15614—8 |
| | 9:2575 | DOE/ET/15614—9 |
| | 9:2576 | DOE/ET/15614—10 |
| | **Avco-Everett Research Lab., Inc., Everett, MA (USA)** | |
| | 9:2577 | DOE/ET/15614—11 |
| | **Avco-Everett Research Lab., Everett, MA (USA)** | |
| | 9:2578 | DOE/ET/15614—13 |
| | 9:2579 | DOE/ET/15614—14 |
| | **Avco-Everett Research Lab., Inc., Everett, MA (USA)** | |
| | 9:2580 | DOE/ET/15614—15 |
| | **Avco-Everett Research Lab., Everett, MA (USA)** | |
| | 9:2581 | DOE/ET/15614—16 |
| **AC22-80PC30013** | **Pennsylvania State Univ., University Park (USA). Coal Research Section** | |
| | 9:1783 | DOE/PC/30013—4 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| **AC22-80PC30185** | **Atlantic Research Corp., Alexandria, VA (USA)** | |
| | 9:3108 | DOE/PC/30185—T1 |
| | 9:3109 | DOE/PC/30185—T2 |
| **AC22-81PC40502** | **TRW Energy Development Group, Redondo Beach, CA (USA)** | |
| | 9:2582 | MHD-III—82-048 |
| **AC22-81PC41265** | **Pennsylvania State Univ., University Park (USA). Materials Research Lab.** | |
| | 9:2070 | DOE/PC/41265—T1 |
| **AC22-81PC41755** | **Southwest Research Inst., San Antonio, TX (USA)** | |
| | 9:1760 | DOE/PC/41755—T1 |
| **AC22-82PC50051** | **Aspen Technology, Inc., Cambridge, MA (USA)** | |
| | 9:1761 | DOE/PC/50051—T3 |
| **AC22-83PC60577** | **TRW Energy Development Group, Redondo Beach, CA (USA)** | |
| | 9:2583 | MHD-III—83-070 |
| **AC97-79ET44614** | **Texas Univ., Austin (USA). Bureau of Economic Geology** | |
| | 9:1814 | DOE/ET/44614—T5 |
| **AI01-76ET10393** | **NCB (IEA Grimethorpe) Ltd., Barnsley, South Yorkshire (UK)** | |
| | 9:3107 | DOE/ET/10393—1461 |
| **AI01-76ET20320** | **Massachusetts Inst. of Tech., Cambridge (USA). Aeroelastic and Structures Research Lab.** | |
| | 9:2181 | DOE/ET/20320—T1 |
| **AI01-77CS51040** | **Little (Arthur D.), Inc., Cambridge, MA (USA)** | |
| | 9:2665 | DOE/NASA/0254—1 |
| **AI01-79CS20396** | **Department of Commerce, Washington, DC (USA)** | |
| | 9:2589 | DOE/CS/20396—T1 |
| **AI04-80AL12726** | **Allied Chemical Co., Solvay, NY (USA). Syracuse Research Lab.** | |
| | 9:2519 | DOE/NASA/0250—1 |
| **AI08-79DP40092** | **Naval Research Lab., Washington, DC (USA)** | |
| | 9:4184 | NRL-MR—5161 |
| | 9:4185 | NRL-MR—5186 |
| **AI21-80ET17088** | **National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center** | |
| | 9:2584 | DOE/NASA/17088—4 |
| **AM01-76EI02295** | **Massachusetts Inst. of Tech., Cambridge (USA)** | |
| | 9:2560 | DOE/EI/02295—1 |
| **AM03-76SF00010** | **Physics International Company, San Leandro, California 94577** | |
| | 9:4198 | Journal of Applied Physics 54 NO. 4. 1656-1665 (Apr 1983). |
| **AM03-76SF00034** | **Univ. of California, Santa Barbara** | |
| | 9:2922 | Inorganic Chemistry 22 NO. 20. 2813-2818 (28 Sep 1983). |
| **AM03-76SF00767** | **Arthur Amos Noyes Laboratory of Chemical Physics, California Institute of Technology, Pasadena, Cali** | |
| | 9:2963 | Physical Review Letters 49 NO. 25. 1847-1850 (20 Dec 1982). |
| **AS01-77ET29035** | **Texas A and M Univ., College Station (USA). Research Foundation** | |
| | 9:2563 | DOE/ET/29035—1 |
| **AS05-76ER03992** | **Texas Univ., Austin (USA). Center for Particle Theory** | |
| | 9:3734 | DOE/ER/03992—0527 |
| | **Tel Aviv Univ. (Israel)** | |
| | 9:3821 | DOE/ER/03992—526 |
| | **Indian Inst. of Science, Bangalore. Centre for Theoretical Studies** | |
| | 9:3997 | DOE/ER/03992—529 |
| | 9:3998 | DOE/ER/03992—530 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| | **Texas Univ., Austin (USA). Center for Particle Theory** | |
| | 9:3999 | DOE/ER/03992—531 |
| **AS05-76ER05224** | **Texas Univ., Austin (USA)** | |
| | 9:3856 | DOE/ER/05224—7 |
| **AS05-76ET53045** | **College of William and Mary, Williamsburg, VA (USA)** | |
| | 9:4047 | DOE/ET/53045—7 |
| **AS05-76EV03018** | **Louisiana State Univ., Baton Rouge (USA). Dept. of Chemistry** | |
| | 9:3001 | DOE/EV/03018—247 |
| **AS05-77ER05399** | **Louisana State Univ., Baton Rouge** | |
| | 9:2938 | Journal of Physical Chemistry 87 NO. 8. 1464-1466 (14 Apr 1983). |
| **AS05-77ER05489** | **School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332** | |
| | 9:2712 | Physical Review Letters 51 NO. 15. 1359-1361 (10 Oct 1983). |
| **AS05-79ER10348** | **Physics Department, University of Tennessee, Knoxville, Tennessee 37996** | |
| | 9:2781 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2317-2327 (1 Sep 1983). |
| **AS05-79ER10371** | **College of William and Mary, Williamsburg, VA (USA). Dept. of Physics** | |
| | 9:3510 | DOE/ER/10371—5 |
| **AS05-79ER10459** | **Department of Physics and Astronomy, Louisiana State University** | |
| | 9:4122 | Astrophysical Journal 269 NO. 2. 668-670 (15 Jun 1983). |
| **AS05-80ER10599** | **Georgia Inst. of Tech., Atlanta (USA). School of Physics** | |
| | 9:3916 | DOE/ER/10599—21 |
| **AS05-80ER10618** | **Vanderbilt Univ., Nashville, TN (USA). Dept. of Computer Science** | |
| | 9:3511 | DOE/ER/10618—10 |
| **AS05-80ER10711** | **Laboratory for Transport Theory and Statistical Physics, Virginia Polytechnic Institute and State Un** | |
| | 9:3970 | Transport Theory and Statistical Physics 12 NO. 1. 85-101 (Jan 1983). |
| | 9:4124 | Transport Theory and Statistical Physics 12 NO. 1. 73-79 (Jan 1983). |
| **AS05-80ER10745** | **Univ. of Houston, TX** | |
| | 9:3012 | Journal of the American Chemical Society 105 NO. 18. 5752-5755 (7 Sep 1983). |
| **AS05-81ER10815** | **Univ. of North Carolina, Chapel Hill** | |
| | 9:2991 | Journal of the American Chemical Society 105 NO. 5. 1374-1376 (9 Mar 1983). |
| | **North Carolina Univ., Chapel Hill (USA). Dept. of Chemistry** | |
| | 9:3000 | DOE/ER/10815—2 |
| | 9:3003 | Journal of the American Chemical Society 105 NO. 20. 6326-6327 (5 Oct 1983). |
| | 9:3022 | Journal of the American Chemical Society 104 NO. 23. 6200-6206 (17 Nov 1982). |
| **AS07-76ID01526** | **Colorado State Univ., Fort Collins** | |
| | 9:3280 | Great Basin Naturalist 42 NO. 1. 45-49 (Mar 1982). |
| **AS08-81DP40153** | **Department of Physics and Astronomy, University of Hawaii, Honolulu, Hawaii 96822** | |
| | 9:4096 | Review of Scientific Instruments 54 NO. 10. 1311-1330 (Oct 1983). |
| **AS09-76EV00900** | **Wake Forest Univ., Winston-Salem, NC (USA). Dept. of Biology** | |
| | 9:3402 | DOE/EV/00900—6 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| AS09-77ER01023 | **Department of Physics, The University of Georgia, Athens, Georgia 30602** | |
| | 9:4019 | Physical Review Letters 51 NO. 14. 1227-1230 (3 Oct 1983). |
| | 9:4021 | Journal of Mathematical Physics (New York) 24 NO. 10. 2512-2514 (Oct 1983). |
| AT03-76ER70217 | **Univ. of California, Irvine** | |
| | 9:3006 | Journal of Physical Chemistry 87 NO. 20. 3926-3933 (29 Sep 1983). |
| AT03-76ET35300 | **GA Technologies, Inc., San Diego, CA (USA)** | |
| | 9:2238 | GA-A—16807 |
| | 9:2239 | GA-A—16982 |
| AT03-76ET51011 | **GA Technologies, Incorporated, P. O. Box 85608, San Diego, California 92138** | |
| | 9:4079 | Applied Physics Letters 43 NO. 10. 920-922 (15 Nov 1983). |
| | 9:4082 | Physics of Fluids 26 NO. 11. 3300-3307 (Nov 1983). |
| | 9:4090 | Physics of Fluids 26 NO. 11. 3338-3349 (Nov 1983). |
| | 9:4196 | Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films 1 NO. 4. 1861-186 |
| AT03-80ER52061 | **California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering** | |
| | 9:4147 | DOE/ER/52061—1 |
| AT03-81ER10865 | **Edward L. Ginzton Laboratory, W. W. Hansen Laboratories of Physics, Stanford University, Stanford, C** | |
| | 9:3074 | Applied Physics Letters 42 NO. 7. 573-574 (1 Apr 1983). |
| AT03-81ER53111 | **California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering** | |
| | 9:4040 | DOE/ER/53111—1 |
| | **California Univ., Los Angeles (USA)** | |
| | 9:4148 | DOE/ER/53111—2 |
| AT03-82ER54010 | **California Univ., Los Angeles (USA)** | |
| | 9:4044 | DOE/ER/54010—T1 |
| FC03-79ET27196 | **Imperial, County of, El Centro, CA (USA). Dept. of Public Works** | |
| | 9:2150 | CONF-8305149—Summ. |
| FG01-77RG09154 | **Illinois Office of Consumer Services, Springfield (USA)** | |
| | 9:2564 | DOE/RG/09154—T2 |
| FG01-78ET20585 | **Michigan State Univ., East Lansing (USA). Dept. of Forestry** | |
| | 9:2101 | DOE/ET/20585—T1 |
| FG01-79CS20173 | **National League of Cities, Washington, DC (USA)** | |
| | 9:2660 | DOE/CS/20173—T1 |
| FG01-79CS20177 | **New York Energy Office, Albany (USA)** | |
| | 9:2604 | DOE/CS/20177—T1 |
| FG01-79CS20230 | **Middlesex County Dept. of Solid Waste Management, New Brunswick, NJ (USA)** | |
| | 9:2655 | DOE/CS/20230—1 |
| FG01-79RG10174 | **Kennedy/Jenks Engineers, Sacramento, CA (USA)** | |
| | 9:2565 | DOE/RG/10174—T1 |
| FG01-81CS15061 | **Bedrosian and Associates, Alpine, NJ (USA)** | |
| | 9:2638 | DOE/CS/15061—T1 |
| FG01-81CS15066 | **T.I.C. Enterprises, Johnstown, PA (USA)** | |
| | 9:2639 | DOE/CS/15066—T1 |
| FG01-81CS15072 | **Dame (Richard E.), Silver Spring, MD (USA)** | |
| | 9:2142 | DOE/CS/15072—T5 |
| FG01-82CE15094 | **Energotechnology Corp., Cambridge, MA (USA)** | |
| | 9:2184 | CONF-830905—6 |
| FG01-82CE15146 | **Jeppson (Morris R.), Carmel, CA (USA)** | |
| | 9:2637 | DOE/CE/15146—T3 |
| FG01-82EI19624 | **New Hampshire Governor's Council on Energy, Concord (USA)** | |
| | 9:1850 | DOE/EI/19624—T1 |
| FG02-79ET00080 | **Department of Chemical Engineering, Kansas State University, Manhattan, Kansas 66506** | |
| | 9:2126 | Biotechnology and Bioengineering XXV NO. 4. 939-965 (Apr 1983). |
| FG03-76ER10058 | **California Inst of Tech., Pasadena** | |
| | 9:2941 | Journal of the American Chemical Society 105 NO. 7. 1878-1882 (6 Apr 1983). |
| | **California Inst. of Tech., Pasadena (USA)** | |
| | 9:4232 | DOE/ER/10058—T1 |
| FG05-80ET53088 | **Texas Univ., Austin (USA). Inst. for Fusion Studies** | |
| | 9:4048 | DOE/ET/53088—110 |
| | 9:4089 | Physics of Fluids 26 NO. 11. 3332-3337 (Nov 1983). |
| | 9:4091 | Physics of Fluids 26 NO. 11. 3242-3245 (Nov 1983). |
| | 9:4101 | Physics of Fluids 26 NO. 10. 2986-2991 (Oct 1983). |
| | 9:4150 | DOE/ET/53088—102 |
| | 9:4151 | DOE/ET/53088—107 |
| FG07-79ET27256 | **Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Center** | |
| | 9:2171 | DOE/ET/27256—T38 |
| FG22-80PC30209 | **Auburn Univ., AL (USA). Coal Conversion Lab.** | |
| | 9:1756 | DOE/PC/30209—T5 |
| FG22-80PC30238 | **New Mexico Highlands Univ., Las Vegas (USA). Div. of Science and Mathematics** | |
| | 9:1791 | DOE/PC/30238—T1 |
| FG22-80PC30249 | **Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science** | |
| | 9:1784 | DOE/PC/30249—T6 |
| FG22-81PC40771 | **Massachusetts Inst. of Tech., Cambridge** | |
| | 9:2988 | Journal of Catalysis 80 NO. 2. 486-489 (Apr 1983). |
| FG22-81PC40774 | **Univ. of Pittsburgh, PA** | |
| | 9:2081 | Journal of Catalysis 83 NO. 2. 415-427 (Oct 1983). |
| FG22-81PC40781 | **State Univ. of New York, Buffalo (USA)** | |
| | 9:1757 | DOE/PC/40781—T8 |
| FG22-81PC40782 | **State Univ. of New York, Binghamton (USA). Dept. of Chemistry** | |
| | 9:1758 | DOE/PC/40782—T5 |
| FG22-81PC40783 | **Pennsylvania State Univ., University Park (USA)** | |
| | 9:1785 | DOE/PC/40783—T12 |
| FG22-81PC40797 | **Rhode Island Univ., Kingston (USA). Dept. of Chemical Engineering** | |
| | 9:1759 | DOE/PC/40797—T1 |
| FG22-82PC50057 | **Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering** | |
| | 9:1762 | DOE/PC/50057—T4 |
| FG22-82PC50793 | **Auburn Univ., AL (USA)** | |
| | 9:1763 | DOE/PC/50793—T1 |
| | 9:1764 | DOE/PC/50793—T2 |
| | 9:1765 | DOE/PC/50793—T4 |
| FG22-82PC50811 | **Rice Univ., Houston, TX (USA). Dept. of Chemical Engineering** | |
| | 9:1786 | DOE/PC/50811—T2 |
| FG22-82PC50812 | **Utah Univ., Salt Lake City (USA)** | |
| | 9:1781 | CONF-830807—14 |
| FG22-83PC60796 | **Chicago Univ., IL (USA)** | |
| | 9:1766 | DOE/PC/60796—1 |
| FG44-80R410154 | **Alabama Univ., University (USA). Dept. of Mechanical Engineering** | |
| | 9:2631 | DOE/R4/10154—T1 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| FG44-80R410157 | **Medical Univ. of South Carolina, Charleston (USA)** | |
| | 9:2172 | DOE/R4/10157—T1 |
| NAS-7-100-956205 | **Spectrolab, Inc., Sylmar, CA (USA)** | |
| | 9:2102 | DOE/JPL/956205—83/5 |
| W-31-109-ENG-38 | **Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439** | |
| | 9:1919 | Journal of Applied Physics 54 NO. 4. 1755-1780 (Apr 1983). |
| | 9:2295 | Numerical Heat Transfer 2 373-385 (1979). |
| | **Argonne National Lab., IL (USA)** | |
| | 9:2346 | ANL/RERTR/TM—3 |
| | 9:2400 | CONF-831235—2 |
| | 9:2465 | ANL-Trans—1215(Jun 1983). |
| | **Texas A and M Univ., College Station (USA). Dept. of Mechanical Engineering** | |
| | 9:2653 | ANL/CNSV-TM—120-Vol.2 |
| | 9:2709 | Journal of Chemical Physics 79 NO. 9. 4522-4531 (1 Nov 1983). |
| | 9:2710 | Journal of Chemical Physics 79 NO. 9. 4532-4538 (1 Nov 1983). |
| | 9:2812 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2845-2847 (1 Sep 1983). |
| | 9:2813 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2873-2876 (1 Sep 1983). |
| | 9:2877 | Wear 67 227-232 (1981). |
| | 9:3014 | Journal of the American Chemical Society 105 NO. 11. 3729-3731 (11 Jun 1983). |
| | 9:3028 | Journal of Chemical Physics 79 NO. 11. 5337-5344 (1 Dec 1983). |
| | 9:3032 | Journal of Physical Chemistry 86 NO. 26. 5093-5097 (23 Dec 1982). |
| | **Argonne National Lab., IL (USA)** | |
| | 9:3139 | ANL-Trans—1212(May 1983). |
| | **Medical Coll. of Wisconsin, Milwaukee (USA)** | |
| | 9:3345 | DOE/NBM—4000571 |
| | 9:3442 | Journal of Applied Physics 54 NO. 4. 1730-1754 (Apr 1983). |
| | 9:3561 | Physical Review [Section] A: General Physics 28 NO. 3. 1401-1404 (Sep 1983). |
| | 9:3567 | Journal of Chemical Physics 78 NO. 7. 4315-4320 (1 Apr 1983). |
| | **Argonne National Lab., IL (USA)** | |
| | 9:3597 | ANL—83-87 |
| | 9:3887 | Physical Review [Section] C: Nuclear Physics 28 NO. 4. 1756-1762 (Oct 1983). |
| | 9:3914 | Physical Review [Section] C: Nuclear Physics 28 NO. 3. 1374-1378 (Sep 1983). |
| | 9:3952 | Physical Review Letters 51 NO. 9. 763-766 (29 Aug 1983). |
| W-7405-ENG-26 | **Oak Ridge National Lab., TN** | |
| | 9:1776 | Proceedings, Intersociety Energy Conversion Engineering Conference 831-837 (Aug 1982). |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:1782 | CONF-8210100—7 |
| | 9:1932 | ORNL-tr—5043(1983). |
| | 9:2276 | CONF-8310102—2 |
| | 9:2282 | ORNL—5986 |
| | **Argonne National Lab., IL (USA)** | |
| | 9:2352 | ANL/RERTR/TM—3(Aug 1983). |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:2398 | CONF-830607—26 |
| | 9:2515 | ORNL/TM—8840 |
| | **TERA, Inc., Arlington, VA (USA)** | |
| | 9:2532 | DOE/NBB—0046 |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:2541 | CONF-8210211—1 |
| | 9:2588 | CONF-830982—1 |
| | 9:2621 | ORNL/CON—118 |
| | 9:2622 | ORNL/CON—142 |
| | **Battelle Columbus Labs., OH (USA)** | |
| | 9:2623 | ORNL/Sub—80-7800/2 |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:2648 | ORNL/TM—8819 |
| | 9:2659 | CONF-8210203—1 |
| | 9:2664 | CONF-830812—59 |
| | 9:2708 | Applied Physics Letters 43 NO. 11. 1017-1019 (1 Dec 1983). |
| | 9:2743 | Materials Performance 21 NO. 1. 18-24 (Jan 1982). |
| | 9:2744 | Solid State Communications 41 NO. 4. 321-324 (1982). |
| | 9:2745 | American Society for Testing and Materials, Special Technical Publication NO. 754. 173-192 |
| | 9:2752 | Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science 121 993 |
| | 9:2754 | Scripta Metallurgica 15 777-782 (1981). |
| | 9:2773 | CONF-821057—7 |
| | 9:2778 | Physical Review [Section] B: Condensed Matter 28 NO. 6. 3007-3013 (15 Sep 1983). |
| | 9:2786 | Physical Review [Section] B: Condensed Matter 27 NO. 2. 1276-1282 (15 Jan 1983). |
| | 9:2787 | Physical Review [Section] B: Condensed Matter 27 NO. 2. 1283-1291 (15 Jan 1983). |
| | 9:2805 | TMS (The Metallurgical Society) Paper Selection 225-239 (1979). |
| | 9:2834 | Applied Physics Letters 43 NO. 10. 957-959 (15 Nov 1983). |
| | 9:2866 | Journal of Applied Physics 54 NO. 4. 2125-2126 (Apr 1983). |
| | 9:2874 | TMS (The Metallurgical Society) Paper Selection 151-163 (1981). |
| | 9:2876 | Philosophical Magazine, [Part] A: Defects and Mechanical Properties 43 NO. 6. 1515-1535 (1 |
| | 9:2884 | CONF-8210100—6 |
| | **Oak Ridge Gaseous Diffusion Plant, TN (USA)** | |
| | 9:2889 | K/PS—5013-EA |
| | 9:2905 | Surface and Interface Analysis 4 NO. 4. 125-134 (1982). |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:2907 | CONF-821053—4 |
| | 9:2934 | Journal of Physical Chemistry 87 NO. 17. 3193-3197 (18 Aug 1983). |
| | 9:2947 | IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics 1 |
| | 9:2994 | Journal of Magnetic Resonance 49 84-92 (1982). |
| | **Oak Ridge Y-12 Plant, TN (USA)** | |
| | 9:3106 | Y/DZ—77 |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:3141 | CONF-8309127—5 |
| | **Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory** | |
| | 9:3257 | CONF-821054—2 |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:3263 | ORNL/TM—8414 |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| | **Oak Ridge Gaseous Diffusion Plant, TN (USA)** | |
| | 9:3273 | K/PS—5027 |
| | **Oak Ridge National Lab., TN (USA)** | |
| | 9:3287 | CONF-821053—5 |
| | 9:3297 | Health Physics 45 NO. 3. 631-642 (Sep 1983). |
| | 9:3299 | Health Physics 45 NO. 3. 731-744 (Sep 1983). |
| | 9:3324 | American Naturalist 120 NO. 5. 628-648 (Nov 1982). |
| | 9:3325 | CONF-8310206—1 |
| | 9:3335 | Ecology 64 NO. 5. 1249-1265 (1983). |
| | 9:3343 | Ecology 63 NO. 6. 1771-1779 (Dec 1982). |
| | 9:3380 | Applied and Environmental Microbiology 45 NO. 2. 536-545 (Feb 1983). |
| | 9:3392 | Health Physics 45 NO. 3. 665-686 (Sep 1983). |
| | 9:3403 | CONF-821048—3 |
| | 9:3422 | Carcinogenesis (New York) 3 NO. 11. 1243-1245 (1982). |
| | 9:3555 | Physical Review Letters 51 NO. 14. 1251-1254 (3 Oct 1983). |
| | 9:3572 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science 3 |
| | 9:3934 | Physical Review [Section] C: Nuclear Physics 28 NO. 3. 1404-1406 (Sep 1983). |
| | 9:3956 | Reviews of Modern Physics 55 NO. 1. 287-314 (Jan 1983). |
| | 9:3967 | Physical Review [Section] A: General Physics 28 NO. 3. 1260-1266 (Sep 1983). |
| | 9:3974 | ORNL/TM—8697 |
| | 9:3992 | Journal of Applied Crystallography 14 219-222 (1981). |
| | 9:4039 | CONF-8209191—1 |
| | 9:4073 | ORNL/TM—8713 |
| | 9:4074 | ORNL/TM—8837 |
| | 9:4075 | ORNL/TM—8871 |
| | 9:4076 | ORNL/TM—8874 |
| | 9:4085 | Physics of Fluids 26 NO. 11. 3164-3167 (Nov 1983). |
| | 9:4098 | Review of Scientific Instruments 54 NO. 10. 1420-1421 (Oct 1983). |
| | 9:4146 | CONF-8210204—1 |
| | 9:4186 | ORNL/TM—8826 |
| | 9:4237 | ORNL—5933 |
| | 9:4242 | ORNL/CSD—126 |
| | 9:4252 | Communications in Statistics. Part B: Simulation and Computation 11 NO. 4. 377-519 (1982). |
| | 9:4271 | ORNL—5957 |
| W-7405-ENG-36 | **Los Alamos National Lab., NM (USA)** | |
| | 9:2109 | LA-UR—83-2761 |
| | 9:2168 | LA-UR—83-3071 |
| | 9:2169 | LA-UR—83-3072 |
| | 9:2705 | LA-UR—83-2982 |
| | 9:3098 | LA—9849-MS |
| | 9:3117 | LA—9871-MS |
| | 9:3140 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science 3 |
| | 9:3188 | LA-UR—83-3012 |
| | 9:3220 | Society of Petroleum Engineers Journal 186 232-237 (1979). |
| | 9:3222 | LA—9651-MS |
| | 9:3223 | LA-UR—83-2847 |
| | 9:3251 | LA—9748-MS |
| | 9:3389 | Health Physics 45 NO. 3. 587-592 (Sep 1983). |
| | 9:3411 | LA-UR—83-3110 |
| | 9:3446 | LA-UR—83-2586 |
| | 9:3447 | LA-UR—83-2681 |
| | 9:3448 | LA-UR—83-2776 |
| | 9:3449 | LA-UR—83-2777 |
| | 9:3450 | LA-UR—83-2887 |
| | 9:3451 | LA-UR—83-2896 |
| | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:3452 | LA-UR—83-2901 |
| | **Los Alamos National Lab., NM (USA)** | |
| | 9:3498 | LA-UR—83-2997 |
| | 9:3535 | LA-UR—83-3014 |
| | 9:3536 | LA-UR—83-3095 |
| | 9:3634 | LA—9798-P |
| | 9:3706 | LA-UR—83-3096 |
| | 9:3768 | LA—9587-MS |
| | 9:3770 | LA-UR—83-3067 |
| | 9:3866 | LA-UR—83-2763 |
| | 9:3908 | LA-UR—83-2927 |
| | 9:4014 | LA—9856-MS |
| | 9:4071 | LA—9848-MS |
| | 9:4178 | LA—9737-MS |
| | 9:4225 | LA-tr—83-21(1983). |
| | 9:4236 | LA—9875-MS |
| | 9:4254 | LA-UR—83-2979 |
| | 9:4255 | LA-UR—83-2980 |
| W-7405-ENG-48 | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:1821 | NUREG/CR—3467 |
| | 9:1879 | UCID—19075-Vol.2 |
| | 9:1880 | UCRL—88495-REV.1 |
| | 9:1881 | UCRL—89307 |
| | 9:1903 | UCID—19917 |
| | 9:1915 | UCRL-Trans—11919(6 Nov 1983). |
| | 9:1916 | UCRL-Trans—11920(Nov 1983). |
| | 9:1917 | UCRL-Trans—11921(Nov 1983). |
| | 9:1918 | UCRL-Trans—11923(Nov 1983). |
| | 9:1920 | UCRL-Trans—11922(1983). |
| | 9:1999 | UCID—19926 |
| | **Saint Cloud State Univ., MN (USA). Dept. of Chemistry** | |
| | 9:2000 | UCRL—15560 |
| | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:2206 | UCRL—86246 |
| | 9:2390 | UCRL—89797 |
| | 9:2454 | Health Physics 45 NO. 3. 575-578 (Sep 1983). |
| | **Case Western Reserve Univ., Cleveland, OH (USA). Case Center for Electrochemical Sciences** | |
| | 9:2523 | UCRL—15549 |
| | 9:2526 | Solid State Ionics 7 61-64 (1982). |
| | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:2668 | UCRL—15562 |
| | 9:2707 | UCRL—87469 |
| | 9:2714 | Physical Review Letters 51 NO. 12. 1073-1076 (19 Sep 1983). |
| | 9:2741 | Applied Optics 21 NO. 20. 3685-3688 (15 Oct 1982). |
| | 9:2753 | Journal of Crystal Growth 12A 95-100 (Jan 1981). |
| | 9:2760 | Scripta Metallurgica 14 979-982 (1980). |
| | 9:2765 | Scripta Metallurgica 14 959-962 (1980). |
| | 9:2784 | Journal of Physical Chemistry 87 NO. 5. 788-793 (3 Mar 1983). |
| | 9:2789 | Applied Optics 21 NO. 20. 3689-3694 (15 Oct 1982). |
| | 9:2800 | Journal of Materials Science 14 2721-2725 (1979). |
| | 9:2869 | High Temperature Science 15 NO. 4. 275-292 (Dec 1982). |
| | 9:2900 | Review of Scientific Instruments 54 NO. 10. 1356-1361 (Oct 1983). |

| Contract No. | Abstract No. | Report No. |
|---|---|---|
| | 9:2968 | ACS Symposium Series NO. 188. 57-73 (1982). |
| | **National Research Lab. of Metrology, Sakura, Ibaraki (Japan)** | |
| | 9:3054 | UCRL-Trans—11918(5 Nov 1983). |
| | **Transnuclear, Inc., White Plains, NY (USA)** | |
| | 9:3067 | UCRL—15496 |
| | **TRW Energy Development Group, Redondo Beach, CA (USA)** | |
| | 9:3076 | UCRL—15559-Vol.1 |
| | 9:3077 | UCRL—15559-Vol.2 |
| | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:3078 | UCRL—15561 |
| | 9:3083 | UCRL—89923 |
| | 9:3096 | UCRL—89298 |
| | 9:3097 | UCRL-Trans—11916(5 Nov 1983). |
| | 9:3101 | UCID—19918 |
| | 9:3102 | UCRL—88672 |
| | 9:3103 | Applied Physics Letters 43 NO. 10. 946-948 (15 Nov 1983). |
| | 9:3126 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science 3 |
| | 9:3137 | UCRL—88921 |
| | 9:3138 | Physical Review Letters 51 NO. 9. 723-726 (29 Aug 1983). |
| | 9:3152 | UCRL—89214 |
| | 9:3195 | UCRL—89632 |
| | 9:3219 | Physica Status Solidi [Sectio] A: Applied Research 55 563-568 (1979). |
| | 9:3226 | CONF-8305107— |
| | 9:3252 | UCRL—88961 |
| | 9:3267 | UCID—19822-Rev.1 |
| | 9:3268 | UCRL—89964 |
| | 9:3431 | UCID—19928 |
| | 9:3432 | UCRL—86248 |
| | 9:3433 | IEEE (Institute of Electrical and Electronics Engineers) Transactions on Antennas and Prop |
| | 9:3437 | UCID—19923 |
| | 9:3477 | Astrophysical Journal 267 NO. 2. 766-777 (15 Aug 1983). |
| | **Colorado Univ., Boulder (USA)** | |
| | 9:3538 | UCRL—15564 |
| | **Lawrence Livermore National Lab., CA (USA)** | |
| | 9:3539 | UCRL—89753 |
| | 9:3540 | UCRL—89993 |
| | 9:3600 | Physics of Fluids 26 NO. 11. 3246-3246 (Nov 1983). |
| | 9:3604 | Physical Review [Section] A: General Physics 28 NO. 3. 1637-1646 (Sep 1983). |
| | 9:3915 | Physical Review Letters 49 NO. 25. 1815-1818 (20 Dec 1982). |
| | 9:3924 | Physical Review [Section] C: Nuclear Physics 28 NO. 4. 1475-1492 (Oct 1983). |
| | 9:3975 | UCRL—88041 |
| | 9:4015 | UCRL—89397 |
| | 9:4020 | Journal of the Optical Society of America 73 NO. 10. 1296-1304 (Oct 1983). |
| | 9:4029 | Optics Letters 7 NO. 12. 620-622 (Dec 1982). |
| | 9:4078 | UCRL—89570 |
| | 9:4093 | Physics of Fluids 26 NO. 10. 2774-2777 (Oct 1983). |
| | 9:4094 | Physics of Fluids 26 NO. 10. 2778-2780 (Oct 1983). |
| | 9:4105 | Physics of Fluids 26 NO. 10. 3053-3065 (Oct 1983). |
| | 9:4121 | Journal of Computational Physics 51 NO. 1. 107-138 (Jul 1983). |
| | 9:4123 | Physics Today 36 NO. 5. 54-63 (May 1983). |
| | 9:4188 | UCID—19903 |
| | 9:4189 | UCRL—88669 |
| | 9:4190 | UCRL—88690 |
| | 9:4191 | UCRL—89195 |
| | 9:4192 | UCRL—89327 |
| | 9:4193 | UCRL—89844 |
| | 9:4226 | Applied Optics 21 NO. 20. 3633-3643 (15 Oct 1982). |
| | 9:4245 | UCID—19919 |
| | 9:4246 | UCRL—88913 |
| | 9:4247 | UCRL—89894 |
| | 9:4248 | UCRL—89969 |
| W-7405-ENG-82 | **Ames Lab., IA (USA)** | |
| | 9:2090 | IS—4820-Vol.1-2 |
| | 9:2715 | Physical Review [Section] B: Condensed Matter 28 NO. 6. 2957-2961 (15 Sep 1983). |
| | 9:2855 | Physical Review [Section] B: Condensed Matter 28 NO. 5. 2732-2742 (1 Sep 1983). |
| | 9:2920 | Inorganic Chemistry 22 NO. 20. 2786-2787 (28 Sep 1983). |
| | 9:2921 | Inorganic Chemistry 22 NO. 20. 2789-2790 (28 Sep 1983). |
| | 9:2929 | Inorganic Chemistry 22 NO. 19. 2669-2672 (14 Sep 1983). |
| | 9:2977 | Journal of Physical Chemistry 87 NO. 19. 3590-3592 (15 Sep 1983). |
| | 9:2979 | Inorganic Chemistry 22 NO. 19. 2779-2781 (14 Sep 1983). |
| | 9:3021 | Inorganic Chemistry 22 NO. 5. 847-848 (2 Mar 1983). |
| | 9:3068 | Journal of Low Temperature Physics 52 NO. 5. 449-496 (1 Sep 1983). |
| | 9:3091 | IS—4838 |
| | 9:3603 | Applied Spectroscopy 37 NO. 5. 425-428 (Sep 1983). |
| | 9:4011 | IS—4815 |

# REPORT NUMBER INDEX

The numbers assigned to reports cited in this publication appear in the first column of the index. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index. To expedite the filling of orders for reports from NTIS and TIC, an order number in the form, DE82000001 OR TI82000001, appears in column 3. Order numbers with DE prefixes may be used in ordering from both NTIS and TIC. Numbers with TI prefixes are valid at TIC only. Requesters are urged to use this order number where provided. In column 4, one or more DOE distribution categories are indicated, e.g. , STD-10, MN-25. STD indicates distribution was made in full-size copy; MN indicates microcopy distribution; ND indicates no distribution was made. These category numbers are included to assist DOE librarians in responding to requests for reports in their collections. The UC (Unclassified Distribution Categories) are defined in DOE/TIC-4500, available from TIC. The citation numbers are given in column 5. NOTE: DOE attempts to disseminate its information as broadly as possible. Even though a report may contain some degree of illegibility, it is believed that the report may still make a contribution. The presence of a 1, 2, or 3 following NTIS in the availability column denotes the extent to which a report may be illegible and the form in which it is available: 1 = 1 to 5% illegibility, available PC and MF; 2 = 6 to 10% illegibility, available MF only; 3 = 11% or more illegibility, available PC only. For the users of DOE/RECON, report ordering may be accomplished more expeditiously via the on-line system. Employees of DOE or DOE contractors are urged to order from the Technical Information Center (TIC); all others should order from the National Technical Information Service (NTIS). Procedures for on-line ordering are detailed in the DOE/RECON User's Manual (DOE/TIC-4586).

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| **AD-A-** | | | | |
| 126329 | *See* N-8326775 | | | 9:3460 |
| 130168/ 8 | NTIS, PC A03/MF A01 | | | 9:3498 |
| 130277/ 7 | NTIS, PC A03/MF A01 | | | 9:3511 |
| 130291/ 8 | NTIS, PC A07/MF A01 | | | 9:3231 |
| 130444/ 3 | NTIS, PC A06/MF A01 | | | 9:2092 |
| 130666/ 1 | NTIS, PC A03/MF A01 | | | 9:3003 |
| 130716/ 4 | NTIS, PC A02/MF A01 | | | 9:2104 |
| 130777/ 6 | NTIS, PC A03/MF A01 | | | 9:1868 |
| 130879/ 0 | NTIS, PC A03/MF A01 | | | 9:2523 |
| 130930/ 1 | NTIS, PC A03/MF A01 | | | 9:3499 |
| 130931/ 9 | NTIS, PC A02/MF A01 | | | 9:3278 |
| 130953/ 3 | NTIS, PC A04/MF A01 | | | 9:3500 |
| 131129/ 9 | NTIS, PC A14/MF A01 | | | 9:3327 |
| 131229/ 7 | NTIS, PC A02/MF A01 | | | 9:3390 |
| 131274/ 3 | NTIS, PC A04/MF A01 | | | 9:3501 |
| 131300/ 6 | NTIS, PC A02/MF A01 | | | 9:3004 |
| 131301/ 4 | NTIS, PC A02/MF A01 | | | 9:2105 |
| 131339/ 4 | NTIS, PC A02/MF A01 | | | 9:3391 |
| 131372/ 5 | NTIS, PC A03/MF A01 | | | 9:3429 |
| 131425/ 1 | NTIS, PC A10/MF A01 | | | 9:3333 |
| 131431/ 9 | NTIS, PC A04/MF A01 | | | 9:3502 |
| 131448/ 3 | NTIS, PC A04/MF A01 | | | 9:3503 |
| 131460/ 8 | NTIS, PC A03/MF A01 | | | 9:2155 |
| 131506/ 8 | NTIS, PC A04/MF A01 | | | 9:3430 |
| 131522/ 5 | NTIS, PC A05/MF A01 | | | 9:1859 |
| 131527/ 4 | NTIS, PC A03/MF A01 | | | 9:3262 |
| 131709/ 8 | NTIS, PC A02/MF A01 | | | 9:2912 |
| 131724/ 7 | NTIS, PC A08/MF A01 | | | 9:2093 |
| 131777/ 5 | NTIS, PC A02/MF A01 | | | 9:3512 |
| 131805/ 4 | NTIS, PC A03/MF A01 | | | 9:1818 |
| 132041/ 5 | NTIS, PC A03/MF A01 | | | 9:1796 |
| 132044/ 9 | NTIS, PC A03/MF A01 | | | 9:3030 |
| **AD-P-** | | | | |
| 001277/ 3 | NTIS, PC A02/MF A01 | | | 9:3431 |
| 001593/ 3 | NTIS, PC A02/MF A01 | | | 9:2200 |
| 001601/ 4 | NTIS, PC A02/MF A01 | | | 9:2550 |
| **ADL-** | | | | |
| 88100-00-VOL-2 | *See* AD-A-131129/9 | | | 9:3327 |
| **AEEW-R-** | | | | |
| 1588 | NTIS (US Sales Only), PC A03/MF A01 | DE83704292 | MN -4 | 9:1927 |
| **AERE-G-** | | | | |
| 2599 | NTIS (US Sales Only), PC A02/MF A01 | DE83703804 | MN -70 | 9:1945 |
| **AFGL-TR-** | | | | |
| 82-0253 | *See* N-8326775 | | | 9:3460 |
| **ANL-** | | | | |
| 83-87 | NTIS, PC A03/MF A01 | DE84002218 | MN -38 | 9:3603 |
| **ANL/CNSV-TM-** | | | | |
| 120-Vol.2 | NTIS, PC A10/MF A01 | DE84002305 | MN -95e | 9:2659 |
| **ANL/RERTR/TM-** | | | | |
| 3 | NTIS, PC A99/MF A01; 1 | DE84000189 | MN -83 | 9:2352 |
| **ANL-Trans-** | | | | |
| 1212 | NTIS, PC A03/MF A01; 1 | DE84002699 | MN -34D | 9:3145 |
| 1215 | NTIS, PC A02/MF A01; 1 | DE84002698 | MN -80 | 9:2471 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| **ANSI/ANS-** | | | | |
| 2.7-1982 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $16.00 | | | 9:2510 |
| 3.3-1982 | American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525, $20.00 | | | 9:2509 |
| 6.1.1-1977 | American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525, $12.00 | | | 9:3983 |
| 6.3.1-1980 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $20.00 | | | 9:2512 |
| 8.5-1979 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $16.00 | | | 9:3081 |
| 15.10-1981 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $18.00 | | | 9:2511 |
| 19.5-1978 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $12.00 | | | 9:2332 |
| 55.6-1979 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $35.00 | | | 9:2351 |
| 56.3-1977 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $12.00 | | | 9:2220 |
| 56.8-1981 | American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525, $30.00 | | | 9:2217 |
| 57.1-1980 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $20.00 | | | 9:2218 |
| 57.8-1978 | American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525, $9.00 | | | 9:2219 |
| 58.4-1979 | American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60525, $24.00 | | | 9:2515 |
| 59.1-1979 | American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525, $20.00 | | | 9:2514 |
| **ANU-P-** | | | | |
| 808 | NTIS (US Sales Only), PC A02/MF A01 | DE83703983 | MN -34A | 9:3513 |
| **AV-** | | | | |
| 9/ 83 | *See* OEFZS-4214 | DE83703812 | MN -70 | 9:1996 |
| 10/ 83 | *See* OEFZS-4215 | DE83703813 | MN -70 | 9:1997 |
| 11/ 83 | *See* OEFZS-4216 | DE83703814 | MN -70 | 9:1998 |
| **AWRE-** | | | | |
| 018/ 82 | HMSO, London, price Pound 1.50 | | ND -34C | 9:3964 |
| **BAW-** | | | | |
| 1643-4 | *See* DOE/ET/34020-4 | DE84002350 | STD -78 | 9:2222 |
| 1681-3 | *See* DOE/ET/34212-40 | DE84002333 | STD -78 | 9:2223 |
| **BBN-** | | | | |
| 3606 | NTIS, PC A10/MF A01; 1 | DE83018241 | MN -95 | 9:2597 |
| **BFR-D-** | | | | |
| 2-1983 | NTIS (US Sales Only), PC A17/MF A01; 1 | DE83751425 | MN -95d | 9:2598 |
| **BM-RI-** | | | | |
| 8773 | *See* PB-83-250902 | | | 9:1802 |
| **BMI/OCRD-** | | | | |
| 4(5) | NTIS, PC A10/MF A01; 1 | DE84002607 | STD -70 | 9:3441 |
| **BNL-** | | | | |
| 33677 | NTIS, PC A02/MF A01 | DE84001459 | MN -34D | 9:3616 |
| 33685 | NTIS, PC A02/MF A01 | DE84001208 | MN -34A | 9:3514 |
| 33700-Summ. | NTIS, PC A03/MF A01; 1 | DE84001674 | MN -95d | 9:2660 |
| 33706 | NTIS, PC A02/MF A01 | DE84000619 | MN -4 | 9:2888 |
| 33767 | NTIS, PC A02/MF A01; 1 | DE84001773 | MN -4 | 9:4236 |
| 33772 | NTIS, PC A02/MF A01 | DE84001669 | MN -4 | 9:4237 |
| 33840 | NTIS, PC A02/MF A01; 1 | DE84002694 | MN -13 | 9:2889 |
| 33859 | NTIS, PC A02/MF A01 | DE84002696 | MN -28 | 9:3168 |
| **BNL-NUREG-** | | | | |
| 33657 | NTIS, PC A02/MF A01 - GPO | DE84000623 | MN -78 | 9:2221 |
| 33665 | NTIS, PC A02/MF A01 - GPO; 1 | DE83014024 | MN -78 | 9:2403 |
| **BNL-tr-** | | | | |
| 1008 | NTIS, PC A04/MF A01; 1 | DE83017597 | MN -4 | 9:2756 |
| **CAPE-** | | | | |
| 2881 | USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830 | | ND -28 | 9:3125 |
| 2882 | USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830 | | ND -28 | 9:3166 |
| **CEA-BIB-** | | | | |
| 237 | NTIS (US Sales Only), PC A04/MF A01 | DE83704316 | MN -48 | 9:3355 |
| **CEA-CONF-** | | | | |
| 6580 | NTIS (US Sales Only), PC A03/MF A01 | DE83703775 | MN -77 | 9:2820 |
| 6585 | NTIS (US Sales Only), PC A02/MF A01 | DE83703757 | MN -25 | 9:3092 |
| 6607 | NTIS (US Sales Only), PC A02/MF A01 | DE83704318 | MN -48 | 9:3384 |
| 6618 | NTIS (US Sales Only), PC A02/MF A01 | DE83704301 | MN -4 | 9:3356 |
| 6624 | NTIS (US Sales Only), PC A02/MF A01 | DE83703803 | MN -37 | 9:3207 |
| 6634 | NTIS (US Sales Only), PC A02/MF A01 | DE84700001 | MN -34D | 9:4002 |
| 6637 | NTIS (US Sales Only), PC A02/MF A01 | DE83703967 | MN -34D | 9:3824 |
| 6639 | NTIS (US Sales Only), PC A02/MF A01 | DE83703968 | MN -34D | 9:3825 |
| 6648 | NTIS (US Sales Only), PC A02/MF A01 | DE84700064 | MN -34C | 9:3737 |
| 6649 | NTIS (US Sales Only), PC A02/MF A01 | DE84700071 | MN -34C | 9:3889 |
| 6651 | NTIS (US Sales Only), PC A02/MF A01 | DE84700072 | MN -34C | 9:3925 |
| 6652 | NTIS (US Sales Only), PC A03/MF A01 | DE83704304 | MN -25 | 9:2777 |
| 6655 | NTIS (US Sales Only), PC A03/MF A01 | DE83704305 | MN -25 | 9:2778 |
| 6657 | NTIS (US Sales Only), PC A02/MF A01 | DE83704306 | MN -25 | 9:2280 |
| 6659 | NTIS (US Sales Only), PC A02/MF A01 | DE84750124 | MN -59a | 9:2140 |
| 6674 | NTIS (US Sales Only), PC A02/MF A01 | DE84700073 | MN -34C | 9:3875 |
| 6675 | NTIS (US Sales Only), PC A02/MF A01 | DE84700074 | MN -34C | 9:3876 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| CEA-N- | | | | |
| 1466-Pt.8 | NTIS (US Sales Only), PC A04/MF A01 | DE84700075 | MN -34C | 9:3890 |
| 2324 | NTIS (US Sales Only), PC A08/MF A01 | DE84700053 | MN -34D | 9:3738 |
| 2329 | NTIS (US Sales Only), PC A05/MF A01 | DE84700039 | MN -34D | 9:3826 |
| 2331 | NTIS (US Sales Only), PC A05/MF A01 | DE83704307 | MN -25 | 9:2678 |
| 2338 | NTIS (US Sales Only), PC A07/MF A01 | DE84700013 | MN -20 | 9:4147 |
| CEA-R- | | | | |
| 5201 | NTIS (US Sales Only), PC A03/MF A01 | DE83703744 | MN -23 | 9:3169 |
| 5204 | NTIS (US Sales Only), PC A08/MF A01 | DE83704308 | MN -25 | 9:2679 |
| 5209 | NTIS (US Sales Only), PC A06/MF A01 | DE83704309 | MN -25 | 9:2821 |
| 5211 | NTIS (US Sales Only), PC A02/MF A01 | DE83704317 | MN -48 | 9:3292 |
| CLM-R- | | | | |
| 226 | HMSO, London, price Pound 2.00 | | ND -20 | 9:4148 |
| 227 | Available from HMSO, London, price Pound 2.00 | | ND -20 | 9:4041 |
| 229 | HMSO, London, price Pound 3.00 | | ND -20 | 9:4042 |
| 230 | Available from HMSO, London, price Pound 2.00 | | ND -20 | 9:4149 |
| 231 | Available from HMSO, London, price Pound 3.00 | | ND -20 | 9:4150 |
| 232 | HMSO, London, price Pound 2.00 | | ND -20 | 9:4151 |
| 233 | Available from HMSO, London, price Pound 2.00 | | ND -20 | 9:4043 |
| 234 | Available from HMSO, London, price Pound 6.00 | | ND -20 | 9:4044 |
| CONF-7603133- | (IADC rotary drilling conference, Dallas, TX, USA, 9-12 Mar 1976) | | | |
| 1 | *See* HTC-2M7-77 | | MN -92a | 9:3071 |
| CONF-770793- | (Symposium of Arquelogia historia, Guanajuato, Mexico, 30 Jul-6 Aug 1977) | | | |
| 1 | *See* BNL-33706 | DE84000619 | MN -4 | 9:2888 |
| CONF-7904180- | (Symposium on new technologies in the development of oil and gas resources, Luxembourg, Luxembourg, 18-20 Apr 1979) | | | |
| (Vol.1) | Graham & Trotman Ltd., Bond Street House, 14 Clifford Street, London, W1X 1Rd, England | | | 9:1829 |
| CONF-8009308- | (IAEA interregional training course on safety analysis, Karlsruhe, F.R. Germany, 3 Sep-15 Oct 1980) | | | |
| 57 | *See* INIS-mf-8447 | DE83703309 | MN -80 | 9:2345 |
| 58 | *See* INIS-mf-8446 | DE83703332 | MN -2 | 9:2305 |
| 59 | *See* INIS-mf-8454 | DE83703333 | MN -2 | 9:2306 |
| CONF-801144- | (International meeting on development, fabrication, and application of reduced-enrichment fuels for research and test reactors, Argonne, IL, USA, 13-14 Nov 1980) | | | |
| | *See* ANL/RERTR/TM-3 | DE84000189 | MN -83 | 9:2352 |
| CONF-8012117- | (1. Latin-American colloquium of surface physics, Niteroi, Brazil, 1-5 Dec 1980) | | | |
| | *See* INIS-BR-79 | DE83704381 | MN -34A | 9:3984 |
| CONF-8105139- | (ASM metallurgical technology of uranium and uranium alloys seminar, Gatlinburg, TN, USA, 26-28 May 1981) | | | |
| 15 | *See* UCRL-87469 | DE84002773 | MN -38 | 9:2713 |
| CONF-810621- | (Symposium on fluid mechanics of combustion systems, Boulder, CO, USA, 22-24 Jun 1981) | | | |
| 7 | *See* NYU/DAS-80-20 | DE84000358 | MN -95 | 9:2626 |
| CONF-8106294- | (Seminar on nuclear techniques in agriculture and environment, Kuala Lumpur, Malaysia, 8-11 Jun 1981) | | | |
| 7 | *See* INIS-mf-8050 | DE83703607 | MN -23 | 9:3389 |
| CONF-810940- | (Annual contractors' review meeting on thermal and chemical storage, Tysons Corner, VA, USA, 16 Sep 1981) | | | |
| | *See* N-8325076 | | | 9:2151 |
| | *See* N-8325083 | | | 9:2152 |
| | *See* N-8325091 | | | 9:2520 |
| | *See* N-8325069 | | | 9:2619 |
| CONF-8109134- | (International conference on industrial application of radioisotopes and radiation technology, Grenoble, France, 28 Sep-2 Oct 1981) | | | |
| Absts. | *See* INIS-mf-8407 | DE83703331 | MN -2 | 9:2303 |
| Absts. | *See* INIS-mf-8431 | DE83703330 | MN -2 | 9:2317 |
| CONF-8109220- | (IAEA interregional training course on nuclear power plant operational safety, Karlsruhe, F.R. Germany, 7 Sep-23 Oct 1981) | | | |
| 28 | *See* INIS-mf-8411 | DE83703310 | MN -78 | 9:2419 |
| 29 | *See* INIS-mf-8416 | DE83703311 | MN -78 | 9:2210 |
| 30 | *See* INIS-mf-8408 | DE83703312 | MN -78 | 9:2418 |
| 31 | *See* INIS-mf-8409 | DE83703313 | MN -78 | 9:2226 |
| 32 | *See* INIS-mf-8413 | DE83703314 | MN -78 | 9:2420 |
| 33 | *See* INIS-mf-8414 | DE83703315 | MN -78 | 9:2421 |
| 34 | *See* INIS-mf-8417 | DE83703316 | MN -78 | 9:2422 |
| 35 | *See* INIS-mf-8420 | DE83703317 | MN -78 | 9:2227 |
| 36 | *See* INIS-mf-8421 | DE83703318 | MN -78 | 9:2228 |
| 37-Pt.1A | *See* INIS-mf-8439 | DE83703319 | MN -78 | 9:2229 |
| 38 | *See* INIS-mf-8464 | DE83703320 | MN -78 | 9:2230 |
| 39 | *See* INIS-mf-8466 | DE83703322 | MN -80 | 9:2211 |
| 44 | *See* INIS-mf-8543 | DE83703596 | MN -80 | 9:2436 |
| CONF-8109234- | (International meeting on relativistic astrophysics, origins and evolution of the solar system and late states of solar evolution, Innsbruck, Austria, 15-18 Sep 1981) | | | |
| No.57 | Fachinformationszantrum Energie, Physik, Mathematik, Karlsruhe Germany, F.R. | | | 9:3497 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| CONF-811048- | (International symposium on indoor air pollution, health and energy conservation, Amherst, MA, USA, 13-16 Oct 1981) | | | |
| | Environ. Int., 8: No. 1-6, 453-459(1982) | | | 9:2635 |
| | Environ. Int., 8: No. 1-6, 487-496(1982) | | | 9:2636 |
| CONF-811066- | (International energy storage conference, Seattle, WA, USA, 19-21 Oct 1981) | | | |
| | *See* N-8325048 | | | 9:2518 |
| CONF-8110299- | (DOE workshop on analytical chemistry, Paris, France, 1 Oct 1981) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84000110 | MN -90a | 9:1817 |
| 1-Rev. | *See* PNL-SA-9942-Rev. | DE84002548 | MN -48 | 9:3420 |
| CONF-8110303- | (Forum on district heating for Long Island, Upton, NY, USA, 19 Oct 1981) | | | |
| Summ. | *See* BNL-33700-Summ. | DE84001674 | MN -95d | 9:2660 |
| CONF-8111188- | (4. international conference on vehicle structural mechanics, Detroit, MI, USA, 1 Nov 1981) | | | |
| 1 | NTIS, PC A02/MF A01; 1 | DE84002368 | MN -25 | 9:2808 |
| CONF-811288- | (Seminar on solar energy utilization by climate-adjusted planning and building, Berlin, F.R. Germany, 14-15 Dec 1981) | | | |
| | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83770420 | MN -59 | 9:2599 |
| CONF-820357- | (International conference on spin excitations in nuclei, Telluride, CO, USA, 25-27 Mar 1982) | | | |
| 9 | *See* DOE/ER/02853-20 | DE84002648 | MN -34C | 9:3904 |
| CONF-8205103- | (Workshop on physics at LEAR with low energy cooled antiprotons, Erice, Italy, 9-16 May 1982) | | | |
| 0-Summ. | *See* IPNO-TH-82-27 | DE83704041 | MN -34D | 9:3768 |
| CONF-8205206- | (Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities, Karlsruch, F.R. Germany, 3 May-7 Mar 1982) | | | |
| | *See* IAEA-SR-72 | DE84780010 | MN -80 | 9:1962 |
| CONF-8205209- | (14. meeting of the study group fracturue mechanics and 7. meeting of the study group fatigue strength, Muelheim an der Ruhr, F.R. Germany, 11-13 May 1982) | | | |
| | Deutscher Verband fuer Materialpruefung e.V., Berlin (Germany, F.R.) | | | 9:2752 |
| CONF-820618- | (International conference on plasma physics, Goeteborg, Sweden, 7-21 Jun 1982) | | | |
| 14 | *See* TRITA-EPP-82-04 | DE83704000 | MN -20 | 9:3474 |
| CONF-820653- | (IAEA specialists' meeting on gas-cooled reactor core and high temperature instrumentation, Cumbria, UK, 15-17 Jun 1982) | | | |
| 19 | *See* IAEA-TC-389/6-18 | DE83703776 | MN -77 | 9:2246 |
| 20 | *See* IAEA-TC-389/6-13 | DE83703788 | MN -37 | 9:2386 |
| 21 | *See* IAEA-TC-389/6-19 | DE83703789 | MN -37 | 9:2247 |
| 22 | *See* IAEA-TC-389/6-23 | DE83703799 | MN -37 | 9:2248 |
| CONF-8206220- | (Meeting of HPLC and drugs analysis, Paris, France, 8-9 Jun 1982) | | | |
| 1 | *See* CEA-CONF-6618 | DE83704301 | MN -4 | 9:3356 |
| CONF-820718- | (21. international conference on high energy physics, Paris, France, 29 Jul-8 Aug 1982) | | | |
| 47 | *See* IFVE-OTF-82-106 | DE83703976 | MN -34D | 9:3759 |
| CONF-8208101- | (4. international symposium on radiopharmaceutical chemistry, Juelich, F.R. Germany, 23-27 Aug 1982) | | | |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1552-1554(Nov-Dec 1982) | | | 9:3047 |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1587-1588(Nov-Dec 1982) | | | 9:3048 |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1591-1592(Nov-Dec 1982) | | | 9:3049 |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1614-1615(Nov-Dec 1982) | | | 9:3050 |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1620-1622(Nov-Dec 1982) | | | 9:3051 |
| | J. Labelled Compd. Radiopharm., 19: No. 11-12, 1623-1625(Nov-Dec 1982) | | | 9:3052 |
| CONF-8208103- | (4. European symposium on anti NN and anti QQ interactions, Santiago de Compostella, Spain, 30 Aug-3 Sep 1982) | | | |
| 3 | *See* IPNO-TH-82-46 | DE83704281 | MN -34D | 9:3632 |
| CONF-820931- | (8. symposium on microdosimetry, Juelich, F.R. Germany, 27 Sep-1 Oct 1982) | | | |
| 13 | NTIS, PC A02/MF A01; 1 | DE84001945 | MN -34 | 9:3170 |
| CONF-820991- | (8. international workshop on weak interactions and neutrinos, Javea, Spain, 5-11 Sep 1982) | | | |
| 3 | *See* ISN-82-50 | DE83704289 | MN -34C | 9:3867 |
| CONF-8209134- | (IAEA interregional training course on waste management in nuclear facilities, Karlsruhe, F.R. Germany, 6 Sep-1 Oct 1982) | | | |
| 4 | *See* INIS-mf-8461 | DE83703324 | MN -70 | 9:2318 |
| 5 | *See* INIS-mf-8463 | DE83703325 | MN -70 | 9:1966 |
| 6 | *See* INIS-mf-8470 | DE83703326 | MN -70 | 9:1967 |
| 20 | *See* INIS-mf-8458 | DE83703327 | MN -70 | 9:1963 |
| 21 | *See* INIS-mf-8460 | DE83703334 | MN -2 | 9:1964 |
| 22 | *See* INIS-mf-8462 | DE83703335 | MN -70 | 9:1965 |
| 24 | *See* INIS-mf-8551 | DE83703599 | MN -70A | 9:2388 |
| 25 | *See* INIS-mf-8554 | DE83703600 | MN -70 | 9:1987 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 26 | *See* INIS-mf-8553 | DE83703602 | MN -70 | 9:1986 |
| 27 | *See* INIS-mf-8544 | DE83703603 | MN -70 | 9:1984 |
| 28 | *See* INIS-mf-8550 | DE83703604 | MN -70 | 9:1942 |
| 29 | *See* INIS-mf-8552 | DE83703605 | MN -70 | 9:1985 |
| 30 | *See* INIS-mf-8547 | DE83703606 | MN -71 | 9:1929 |
| 31 | *See* INIS-mf-8535 | DE83703601 | MN -70 | 9:1983 |
| Absts. | Available from Fachinformationszentrum fuer Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.) | | MN -70 | 9:1946 |
| Absts. | Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.) | | | 9:2047 |
| **CONF-8209160-** | (3. symposium on reliability and maintenance, Toulouse, France, 18-22 Sep 1982) | | | |
| 1 | *See* CEA-CONF-6624 | DE83703803 | MN -37 | 9:3207 |
| **CONF-8209191-** | (3. international workshop on ECE and ECRW, Madison, WI, USA, 9-11 Sep 1982) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84000199 | MN -20a | 9:4045 |
| **CONF-8209192-** | (International Society of Electrochemistry meeting, Lyon, France, 6-10 Sep 1982) | | | |
| 1 | *See* LBL-16523 | DE84000167 | MN -94c | 9:2526 |
| **CONF-821048-** | (5. Life Sciences symposium on synthetic fossil fuel technologies, Gatlinburg, TN, USA, 24-27 Oct 1982) | | | |
| 3 | NTIS, PC A03/MF A01; 1 | DE84001997 | MN -48 | 9:3409 |
| **CONF-821053-** | (Workshop on standardization of methods for measuring migration of radionuclides in geomedia, Berlin, F.R. Germany, 25-29 Oct 1982) | | | |
| 4 | NTIS, PC A02/MF A01 | DE84002065 | MN -4 | 9:2913 |
| 5 | NTIS, PC A02/MF A01 | DE84002066 | MN -4 | 9:3293 |
| **CONF-821054-** | (4. symposium on climate processes: sensitivity to solar irradiance and CO/sub 2/, Palisades, NY, USA, 25-27 Oct 1982) | | | |
| 2 | NTIS, PC A03/MF A01; 1 | DE84001950 | MN -11 | 9:3263 |
| **CONF-821057-** | (International conference on the impact of polarized neutrons on solid state chemistry and physics, Grenoble, France, 15-19 Oct 1982) | | | |
| 7 | NTIS, PC A02/MF A01; 1 | DE84002000 | MN -34 | 9:2779 |
| **CONF-8210100-** | (7. international symposium on polynuclear aromatic hydrocarbons, Columbus, OH, USA, 26-28 Oct 1982) | | | |
| 6 | NTIS, PC A02/MF A01 | DE84001955 | MN -4 | 9:2890 |
| 7 | NTIS, PC A02/MF A01 | DE84001992 | MN -4 | 9:1788 |
| **CONF-8210133-** | (8. All-Union conference on charged particles accelerators, Protvino, USSR, 1 Oct 1982) | | | |
| 2 | *See* JINR-9-82-756 | DE83703752 | MN -28 | 9:3126 |
| **CONF-8210181-** | (2. All Union school on the particle-crystal interaction physics, Tashkent, USSR, 1 Oct 1982) | | | |
| 1 | *See* JINR-R-17-82-868 | DE83703989 | MN -34A | 9:2829 |
| **CONF-8210191-** | (Unconventional gas recovery simulation workshop, Morgantown, WV, USA, 26-27 Oct 1982) | | | |
| | *See* DOE/METC-83-45 | DE84000306 | STD -92 | 9:1888 |
| **CONF-8210195-** | (International colloquium on use of the seabed and liabilities, Bordeaux, France, 26-28 Oct 1982) | | | |
| 1 | *See* INIS-mf-8617 | DE83704413 | MN -2 | 9:1989 |
| 2 | *See* INIS-mf-8616 | DE83704425 | MN -2 | 9:1988 |
| 3 | *See* INIS-mf-8620 | DE83704426 | MN -2 | 9:1990 |
| **CONF-8210203-** | (International conference on thermal infrared sensing diagnostics, Detroit, MI, USA, 25 Oct 1982) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84001956 | MN -95d | 9:2665 |
| **CONF-8210204-** | (American Vacuum Society meeting, Baltimore, MD, USA, 16-19 Oct 1982) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84001954 | MN -20a | 9:4152 |
| **CONF-8210211-** | (Conference of the Association for University Business and Economic Research, Knoxville, TN, USA, 25-27 Oct 1982) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84001948 | MN -13 | 9:2547 |
| **CONF-821104-** | (2. international conference on nuclear technology transfer, Buenos Aires, Argentina, 1-5 Nov 1982) | | | |
| | Trans. Am. Nucl. Soc., 42: 91(Nov 1982) | | | 9:2043 |
| | Trans. Am. Nucl. Soc., 42: 108-109(Nov 1982) | | | 9:2240 |
| | Trans. Am. Nucl. Soc., 42: 125-126(Nov 1982) | | | 9:2279 |
| | Trans. Am. Nucl. Soc., 42: 166-167(Nov 1982) | | | 9:2313 |
| | Trans. Am. Nucl. Soc., 42: 119-120(Nov 1982) | | | 9:2314 |
| | Trans. Am. Nucl. Soc., 42: 191(Nov 1982) | | | 9:2399 |
| | Trans. Am. Nucl. Soc., 42: 192-193(Nov 1982) | | | 9:2400 |
| | Trans. Am. Nucl. Soc., 42: 111-113(Nov 1982) | | | 9:2474 |
| | Trans. Am. Nucl. Soc., 42: 113-114(Nov 1982) | | | 9:2475 |
| | Trans. Am. Nucl. Soc., 42: 114-117(Nov 1982) | | | 9:2476 |
| | Trans. Am. Nucl. Soc., 42: 118-119(Nov 1982) | | | 9:2477 |
| | Trans. Am. Nucl. Soc., 42: 124-125(Nov 1982) | | | 9:2478 |
| | Trans. Am. Nucl. Soc., 42: 126-128(Nov 1982) | | | 9:2479 |
| | Trans. Am. Nucl. Soc., 42: 141-142(Nov 1982) | | | 9:2480 |
| | Trans. Am. Nucl. Soc., 42: 142-143(Nov 1982) | | | 9:2481 |
| | Trans. Am. Nucl. Soc., 42: 143-144(Nov 1982) | | | 9:2482 |
| | Trans. Am. Nucl. Soc., 42: 145-146(Nov 1982) | | | 9:2483 |
| | Trans. Am. Nucl. Soc., 42: 146-148(Nov 1982) | | | 9:2484 |
| | Trans. Am. Nucl. Soc., 42: 148-151(Nov 1982) | | | 9:2485 |
| | Trans. Am. Nucl. Soc., 42: 157-158(Nov 1982) | | | 9:2486 |
| | Trans. Am. Nucl. Soc., 42: 158(Nov 1982) | | | 9:2487 |
| | Trans. Am. Nucl. Soc., 42: 163-164(Nov 1982) | | | 9:2488 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| | Trans. Am. Nucl. Soc., 42: 164-165(Nov 1982) | | | 9:2489 |
| | Trans. Am. Nucl. Soc., 42: 165-166(Nov 1982) | | | 9:2490 |
| CONF-8211105- | (Bombannes VALVA symposium, Bordeaux, France, 16-19 Nov 1982) | | | |
| 5 | *See* CEA-CONF-6607 | DE83704318 | MN -48 | 9:3384 |
| CONF-8211107- | (4. international symposium on development of investigation for metals, Saint-Etienne, France, 23-25 Nov 1982) | | | |
| 1 | *See* CEA-CONF-6585 | DE83703757 | MN -25 | 9:3092 |
| CONF-8211108- | (International conference on gas reactors, Bristol, UK, 15 Nov 1982) | | | |
| 1 | *See* CEA-CONF-6580 | DE83703775 | MN -77 | 9:2820 |
| CONF-8211123- | (Bourbaki seminar, Paris, France, 20 Nov 1982) | | | |
| 1 | *See* CEA-CONF-6634 | DE84700001 | MN -34D | 9:4002 |
| CONF-8211128- | (1. conference of the solar energy research center, Bagdad, Iraq, 27-30 Nov 1982) | | | |
| 1 | *See* CEA-CONF-6659 | DE84750124 | MN -59a | 9:2140 |
| CONF-821253- | (Topical meeting on progress in the solution of quantum gauge theories, Trieste, Italy, 17-22 Dec 1982) | | | |
| 1 | *See* CEA-CONF-6637 | DE83703967 | MN -34D | 9:3824 |
| 2 | *See* CEA-CONF-6639 | DE83703968 | MN -34D | 9:3825 |
| CONF-830104- | (International conference on constitutive laws for engineering materials: theory and application, Tucson, AZ, USA, 10-14 Jan 1983) | | | |
| 6 | NTIS, PC A02/MF A01; 1 | DE84002371 | MN -38 | 9:2807 |
| CONF-830117- | (21. international winter meeting on nuclear physics, Bormio, Italy, 24-29 Jan 1983) | | | |
| 14 | *See* CEA-CONF-6651 | DE84700072 | MN -34C | 9:3925 |
| 15 | *See* CEA-CONF-6674 | DE84700073 | MN -34C | 9:3875 |
| 16 | *See* CEA-CONF-6675 | DE84700074 | MN -34C | 9:3876 |
| CONF-830140- | (18. Rencontre de Moriond conference, La Plagne, France, 23-29 Jan 1983) | | | |
| 8 | *See* DESY-83-037 | DE83751352 | MN -34D | 9:3626 |
| CONF-830153- | (Conference on solid fuels technology in the 80s, Stockholm, Sweden, 25 Jan 1983) | | | |
| | *See* IVA-236 | DE83751426 | MN -90 | 9:2097 |
| CONF-830204- | (International beta dosimetry symposium, Washington, DC, USA, 15-18 Feb 1983) | | | |
| 13 | *See* UCRL-88041 | DE84002792 | MN -41 | 9:3981 |
| CONF-830231- | (Europhysics study conference on electroweak effects at high energies, Erice, Italy, 1-10 Feb 1983) | | | |
| 6 | *See* DESY-83-039 | DE83751353 | MN -34D | 9:3627 |
| CONF-830368- | (Non-perturbative quantum chromodynamics conference, Stillwater, OK, USA, 7-9 Mar 1983) | | | |
| 3 | *See* SLAC-PUB-3136 | DE84002375 | MN -34D | 9:3777 |
| CONF-830394- | (7. biennial meeting of nuclear physics, Aussois, France, 14-18 Mar 1983) | | | |
| 1 | *See* CEA-CONF-6648 | DE84700064 | MN -34C | 9:3737 |
| 2 | *See* CEA-CONF-6649 | DE84700071 | MN -34C | 9:3889 |
| 3 | *See* IPNO-DRE-83-07 | DE84700077 | MN -34C | 9:3906 |
| CONF-830451- | (American Ceramic Society annual meeting, Chicago, IL, USA, 25-28 Apr 1983) | | | |
| 26 | *See* GA-A-16982 | DE84002669 | MN -77 | 9:2245 |
| CONF-8304124- | (Specialist meeting on absorbing pins and materials, San Francisco, CA, USA, 11-15 Apr 1983) | | | |
| 5 | *See* CEA-CONF-6652 | DE83704304 | MN -25 | 9:2777 |
| 6 | *See* CEA-CONF-6655 | DE83704305 | MN -25 | 9:2778 |
| 7 | *See* CEA-CONF-6657 | DE83704306 | MN -25 | 9:2280 |
| CONF-8304129- | (8. AIAA conference on aerodynamic decelerator and balloon technology, Hyannis, MA, USA, 2-4 Apr 1983) | | | |
| 1 | *See* SAND-83-2013C | DE84002731 | MN -38 | 9:3072 |
| CONF-830538- | (6. international conference on radiation shielding, Tokyo, Japan, 16-20 May 1983) | | | |
| 19 | *See* HEDL-SA-2755-FP | DE84001478 | MN -79m | 9:2383 |
| CONF-830539- | (International meeting for radionuclide metrology - alpha particle spectrometry and low level measurement, Harwell, UK, 10-13 May 1983) | | | |
| 4-Rev.1 | *See* DP-MS-83-31-Rev.1 | DE84002662 | MN -4 | 9:2891 |
| CONF-8305107- | (17. Asilomar conference on fire and blast effects of nuclear weapons, Pacific Grove, CA, USA, 30 May-3 Jun 1983) | | | |
| | NTIS, PC A13/MF A01; 1 | DE83017704 | MN -2 | 9:3232 |
| CONF-8305149- | (7. annual Imperial County Geothermal Development meeting, El Centro, CA, USA, 5-6 May 1983) | | | |
| Summ. | NTIS, PC A04/MF A01 | DE84000349 | MN -66 | 9:2156 |
| CONF-830607- | (American Society of Mechanical Engineers pressure vessel and piping conference, Portland, OR, USA, 19-24 Jun 1983) | | | |
| 26 | NTIS, PC A03/MF A01 | DE83017204 | MN -78 | 9:2404 |
| 29 | *See* HEDL-SA-2839 | DE84001493 | MN -79h | 9:2414 |
| CONF-830609- | (ANS annual meeting, Detroit, MI, USA, 12-17 Jun 1983) | | | |
| | Trans. Am. Nucl. Soc., 44: 78(Jun 1983) | | | 9:2008 |
| | Trans. Am. Nucl. Soc., 44: 84(Jun 1983) | | | 9:2009 |
| | Trans. Am. Nucl. Soc., 44: 84-85(Jun 1983) | | | 9:2010 |
| | Trans. Am. Nucl. Soc., 44: 85-86(Jun 1983) | | | 9:2011 |
| | Trans. Am. Nucl. Soc., 44: 86-87(Jun 1983) | | | 9:2012 |
| | Trans. Am. Nucl. Soc., 44: 87-88(Jun 1983) | | | 9:2013 |
| | Trans. Am. Nucl. Soc., 44: 88-89(Jun 1983) | | | 9:2014 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| | Trans. Am. Nucl. Soc., 44: 89-90(Jun 1983) | | | 9:2015 |
| | Trans. Am. Nucl. Soc., 44: 99-100(Jun 1983) | | | 9:2016 |
| | Trans. Am. Nucl. Soc., 44: 100(Jun 1983) | | | 9:2017 |
| | Trans. Am. Nucl. Soc., 44: 100-101(Jun 1983) | | | 9:2018 |
| | Trans. Am. Nucl. Soc., 44: 101-102(Jun 1983) | | | 9:2019 |
| | Trans. Am. Nucl. Soc., 44: 102-103(Jun 1983) | | | 9:2020 |
| | Trans. Am. Nucl. Soc., 44: 103-104(Jun 1983) | | | 9:2021 |
| | Trans. Am. Nucl. Soc., 44: 110-112(Jun 1983) | | | 9:2022 |
| | Trans. Am. Nucl. Soc., 44: 112-113(Jun 1983) | | | 9:2023 |
| | Trans. Am. Nucl. Soc., 44: 113-115(Jun 1983) | | | 9:2024 |
| | Trans. Am. Nucl. Soc., 44: 115-116(Jun 1983) | | | 9:2025 |
| | Trans. Am. Nucl. Soc., 44: 116-117(Jun 1983) | | | 9:2026 |
| | Trans. Am. Nucl. Soc., 44: 117-118(Jun 1983) | | | 9:2027 |
| | Trans. Am. Nucl. Soc., 44: 119-120(Jun 1983) | | | 9:2028 |
| | Trans. Am. Nucl. Soc., 44: 120(Jun 1983) | | | 9:2029 |
| | Trans. Am. Nucl. Soc., 44: 121-122(Jun 1983) | | | 9:2030 |
| | Trans. Am. Nucl. Soc., 44: 122(Jun 1983) | | | 9:2031 |
| | Trans. Am. Nucl. Soc., 44: 123-124(Jun 1983) | | | 9:2032 |
| | Trans. Am. Nucl. Soc., 44: 180(Jun 1983) | | | 9:2033 |
| | Trans. Am. Nucl. Soc., 44: 180-181(Jun 1983) | | | 9:2034 |
| | Trans. Am. Nucl. Soc., 44: 181-182(Jun 1983) | | | 9:2035 |
| | Trans. Am. Nucl. Soc., 44: 182-183(Jun 1983) | | | 9:2036 |
| | Trans. Am. Nucl. Soc., 44: 183-184(Jun 1983) | | | 9:2037 |
| | Trans. Am. Nucl. Soc., 44: 184-185(Jun 1983) | | | 9:2038 |
| | Trans. Am. Nucl. Soc., 44: 204-205(Jun 1983) | | | 9:2039 |
| | Trans. Am. Nucl. Soc., 44: 212(Jun 1983) | | | 9:2040 |
| | Trans. Am. Nucl. Soc., 44: 286-287(Jun 1983) | | | 9:2041 |
| | Trans. Am. Nucl. Soc., 44: 107(Jun 1983) | | | 9:2214 |
| | Trans. Am. Nucl. Soc., 44: 239-240(Jun 1983) | | | 9:2215 |
| | Trans. Am. Nucl. Soc., 44: 40-41(Jun 1983) | | | 9:2231 |
| | Trans. Am. Nucl. Soc., 44: 80-82(Jun 1983) | | | 9:2232 |
| | Trans. Am. Nucl. Soc., 44: 82-83(Jun 1983) | | | 9:2233 |
| | Trans. Am. Nucl. Soc., 44: 83(Jun 1983) | | | 9:2234 |
| | Trans. Am. Nucl. Soc., 44: 105-106(Jun 1983) | | | 9:2235 |
| | Trans. Am. Nucl. Soc., 44: 222-223(Jun 1983) | | | 9:2236 |
| | Trans. Am. Nucl. Soc., 44: 223-224(Jun 1983) | | | 9:2237 |
| | Trans. Am. Nucl. Soc., 44: 261-262(Jun 1983) | | | 9:2238 |
| | Trans. Am. Nucl. Soc., 44: 287-288(Jun 1983) | | | 9:2239 |
| | Trans. Am. Nucl. Soc., 44: 214-216(Jun 1983) | | | 9:2253 |
| | Trans. Am. Nucl. Soc., 44: 216-217(Jun 1983) | | | 9:2254 |
| | Trans. Am. Nucl. Soc., 44: 217-218(Jun 1983) | | | 9:2255 |
| | Trans. Am. Nucl. Soc., 44: 218-219(Jun 1983) | | | 9:2256 |
| | Trans. Am. Nucl. Soc., 44: 219(Jun 1983) | | | 9:2257 |
| | Trans. Am. Nucl. Soc., 44: 249-250(Jun 1983) | | | 9:2258 |
| | Trans. Am. Nucl. Soc., 44: 106-107(Jun 1983) | | | 9:2276 |
| | Trans. Am. Nucl. Soc., 44: 288-289(Jun 1983) | | | 9:2277 |
| | Trans. Am. Nucl. Soc., 44: 235-237(Jun 1983) | | | 9:2278 |
| | Trans. Am. Nucl. Soc., 44: 246-247(Jun 1983) | | | 9:2289 |
| | Trans. Am. Nucl. Soc., 44: 44-46(Jun 1983) | | | 9:2290 |
| | Trans. Am. Nucl. Soc., 44: 46-47(Jun 1983) | | | 9:2291 |
| | Trans. Am. Nucl. Soc., 44: 47-48(Jun 1983) | | | 9:2292 |
| | Trans. Am. Nucl. Soc., 44: 48-49(Jun 1983) | | | 9:2293 |
| | Trans. Am. Nucl. Soc., 44: 93-95(Jun 1983) | | | 9:2294 |
| | Trans. Am. Nucl. Soc., 44: 122-123(Jun 1983) | | | 9:2295 |
| | Trans. Am. Nucl. Soc., 44: 244-246(Jun 1983) | | | 9:2296 |
| | Trans. Am. Nucl. Soc., 44: 247-248(Jun 1983) | | | 9:2297 |
| | Trans. Am. Nucl. Soc., 44: 248(Jun 1983) | | | 9:2298 |
| | Trans. Am. Nucl. Soc., 44: 256-257(Jun 1983) | | | 9:2299 |
| | Trans. Am. Nucl. Soc., 44: 108-109(Jun 1983) | | | 9:2312 |
| | Trans. Am. Nucl. Soc., 44: 213-214(Jun 1983) | | | 9:2320 |
| | Trans. Am. Nucl. Soc., 44: 238-239(Jun 1983) | | | 9:2347 |
| | Trans. Am. Nucl. Soc., 44: 41-42(Jun 1983) | | | 9:2397 |
| | Trans. Am. Nucl. Soc., 44: 42-43(Jun 1983) | | | 9:2398 |
| | Trans. Am. Nucl. Soc., 44: 267-268(Jun 1983) | | | 9:2462 |
| | Trans. Am. Nucl. Soc., 44: 211-212(Jun 1983) | | | 9:2463 |
| | Trans. Am. Nucl. Soc., 44: 240-242(Jun 1983) | | | 9:2464 |
| | Trans. Am. Nucl. Soc., 44: 271-272(Jun 1983) | | | 9:2465 |
| | Trans. Am. Nucl. Soc., 44: 272-273(Jun 1983) | | | 9:2466 |
| | Trans. Am. Nucl. Soc., 44: 315-316(Jun 1983) | | | 9:2467 |
| | Trans. Am. Nucl. Soc., 44: 243-244(Jun 1983) | | | 9:2468 |
| | Trans. Am. Nucl. Soc., 44: 254-255(Jun 1983) | | | 9:2469 |
| | Trans. Am. Nucl. Soc., 44: 262-264(Jun 1983) | | | 9:2470 |
| **CONF-830621-** | (IEEE power electronics specialists conference, Albuquerque, NM, USA, 6-9 Jun 1983) | | | |
| 45 | *See* UCRL-88672 | DE84001424 | MN -38 | 9:3108 |
| 46 | *See* UCRL-88690 | DE84002794 | MN -21 | 9:4196 |
| 47 | *See* UCRL-88669 | DE84002790 | MN -21 | 9:4195 |
| **CONF-830622-** | (American Solar Energy Society meeting, Minneapolis, MN, USA, 1-3 Jun 1983) | | | |
| 27 | *See* SERI/TP-215-2009 | DE84000013 | MN -60 | 9:2186 |
| **CONF-830631-** | (6. biennial wind energy conference, Minneapolis, MN, USA, 1-3 Jun 1983) | | | |
| 2 | *See* SLAC-PUB-3129 | DE84002034 | MN -34D | 9:3714 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| CONF-830659- | (TMS/AIME topical conference on ferritic alloys for use in nuclear energy technologies, Snowbird, UT, USA, 19-23 Jun 1983) | | | |
| 13 | *See* HEDL-SA-2786 | DE83017005 | MN -79 | 9:2285 |
| CONF-830689- | (14. international symposium on multiparticle dynamics, Lake Tahoe, NV, USA, 22-27 Jun 1983) | | | |
| 10 | *See* DOE/ER/03992-0527 | DE84002843 | MN -34D | 9:3740 |
| CONF-830695- | (Health Physics Society annual meeting, Baltimore, MD, USA, 19-23 Jun 1983) | | | |
| 8 | *See* HEDL-SA-2829 | DE84001481 | MN -79m | 9:2343 |
| CONF-8306121- | (4. workshop on free-electron laser devices, Eastsound, WA, USA, 27 Jun-1 Jul 1983) | | | |
| 4 | *See* UCRL-89214 | DE84002455 | MN -28 | 9:3158 |
| CONF-8306136- | (International symposium on quarks and nuclear structure, Bad Honnef, F.R. Germany, 13-16 Jun 1983) | | | |
| 2 | *See* DOE/ER/40048-22-N3 | DE84001542 | MN -34D | 9:3741 |
| CONF-8306140- | (Quinta Mesa Redonda de Palenque conference, Palenque, Mexico, 13-18 Jun 1983) | | | |
| 1 | *See* BNL-33767 | DE84001773 | MN -4 | 9:4236 |
| 2 | *See* BNL-33772 | DE84001669 | MN -4 | 9:4237 |
| CONF-830702- | (21. ASME/AIChE national heat transfer conference, Seattle, WA, USA, 24-28 Jul 1983) | | | |
| 23 | NTIS, PC A02/MF A01; 1 | DE84000561 | MN -78 | 9:2405 |
| 24 | *See* EGG-M-08683 | DE84000564 | MN -78 | 9:2409 |
| 25 | *See* EGG-M-27682 | DE84000560 | MN -78 | 9:2411 |
| 26 | *See* EGG-M-07083 | DE84000562 | MN -78 | 9:2408 |
| CONF-830718- | (International Europhysics conference on high energy physics, Brighton, UK, 20-27 Jul 1983) | | | |
| 12 | *See* SLAC-PUB-3202 | DE84002020 | MN -34D | 9:3715 |
| CONF-830719- | (American Physical Society meeting on shock waves in condensed media, Santa Fe, NM, USA, 18-21 Jul 1983) | | | |
| 55 | *See* SAND-83-0930C | DE84002539 | MN -34 | 9:2833 |
| 56 | *See* UCRL-89753 | DE84002468 | MN -34A | 9:3545 |
| CONF-8307104- | (Workshop on astronomy and astrophysics, Santa Cruz, CA, USA, 10-22 Jul 1983) | | | |
| 1 | *See* LA-UR-83-2681 | DE84001320 | MN -34B | 9:3453 |
| 2 | *See* LA-UR-83-2777 | DE84001302 | MN -34B | 9:3455 |
| 3 | *See* LA-UR-83-2776 | DE84001301 | MN -34B | 9:3454 |
| 4 | *See* LA-UR-83-2586 | DE84001355 | MN -34B | 9:3452 |
| CONF-8307105- | (Workshop on site-specific effects of soil and rock on ground motion and their implications for earthquake resistant design, Santa Fe, NM, USA, 26-28 Jul 1983) | | | |
| 1 | *See* UCRL-86248 | DE84001235 | MN -11 | 9:3438 |
| CONF-830802- | (International Union of Theoritical and Applied Mechanics symposium on atmospheric disperation of heavy gases and small particles, Delft, Netherlands, 28 Aug-2 Sep 1983) | | | |
| 4-Rev.1 | *See* UCRL-88495-REV.1 | DE84003003 | MN -92 | 9:1886 |
| CONF-830805- | (7. international conference on structural mechanics in reactor technology, Chicago, IL, USA, 22-26 Aug 1983) | | | |
| 54 | *See* EGG-M-24682 | DE84000662 | MN -78 | 9:2410 |
| 62 | *See* PNL-SA-11214 | DE83017869 | MN -78 | 9:2449 |
| 64 | *See* HEDL-SA-2835-FP | DE84001482 | MN -79h | 9:2413 |
| CONF-830807- | (International conference on coal science, Pittsburgh, PA, USA, 15-19 Aug 1983) | | | |
| 14 | NTIS, PC A02/MF A01; 1 | DE84000512 | MN -90a | 9:1787 |
| CONF-830811- | (Conference on quantitative NDE, Santa Cruz, CA, USA, 7-12 Aug 1983) | | | |
| 18 | *See* UCRL-89298 | DE84002463 | MN -38 | 9:3102 |
| Absts. | *See* IS-4838 | DE84001906 | MN -25 | 9:3097 |
| CONF-830812- | (18. intersociety energy conversion engineering conference, Orlando, FL, USA, 21-26 Aug 1983) | | | |
| 58 | *See* PNL-SA-11136 | DE84001342 | MN -70 | 9:2003 |
| 59 | NTIS, PC A02/MF A01 | DE83017284 | MN -96 | 9:2670 |
| CONF-830815- | (18. annual Microbeam Analysis Society conference, Phoenix, AZ, USA, 8-12 Aug 1983) | | | |
| 11 | *See* HEDL-SA-2874 | DE84001486 | MN -80 | 9:1933 |
| CONF-830816- | (International meeting on light-water reactor severe accident evaluation, Cambridge, MA, USA, 28 Aug-1 Sep 1983) | | | |
| 47 | *See* HEDL-SA-2884a | DE84001488 | MN -78 | 9:2415 |
| CONF-830833- | (International conference on nuclear physics, Florence, Italy, 29 Aug-3 Sep 1983) | | | |
| 4 | *See* DOE/ER/40097-1 | DE84001129 | MN -34C | 9:3905 |
| CONF-830845- | (Environmental degradation of materials in nuclear power systems-water reactors, Myrtle Beach, SC, USA, 22-24 Aug 1983) | | | |
| 7 | *See* BNL-NUREG-33657 | DE84000623 | MN -78 | 9:2221 |
| CONF-830862- | (10. international conference on few-body problems in physics, Karlsruhe, F.R. Germany, 21-27 Aug 1983) | | | |
| 9 | *See* TRI-PP-83-64 | DE84900201 | MN -34D | 9:3820 |
| 10 | *See* SLAC-PUB-3249 | DE84002677 | MN -34D | 9:3779 |
| CONF-830868- | (3. international seminar on assuring structural integrity of steel reactor pressure boundary components, Monterey, CA, USA, 29-30 Aug 1983) | | | |
| 1 | *See* CONF-830607-26 | DE83017204 | MN -78 | 9:2404 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| CONF-830874- | (27. annual international technical symposium on high speed photography, videography and photonics, San Diego, CA, USA, 21-26 Aug 1983) | | | |
| 30 | *See* UCRL-88913 | DE84002779 | MN -32 | 9:4252 |
| CONF-8308106- | (5. annual participants information meeting of DOE low level waste management program, Denver, CO, USA, 30 Aug-1 Sep 1983) | | | |
| 23 | *See* PNL-SA-11541 | DE84002594 | MN -70B | 9:2004 |
| CONF-8308120- | (2. solid oxide fuel cell workshop, Upton, NY, USA, 16-18 Aug 1983) | | | |
| 2 | *See* UCRL-88961 | DE84001423 | MN -35 | 9:3258 |
| CONF-8308131- | (3. international conference on physics in collision, Como, Italy, 31 Aug-2 Sep 1983) | | | |
| 1 | *See* SLAC-PUB-3219 | DE84002082 | MN -28 | 9:3778 |
| CONF-8308132- | (NATO/CAP institute on moment formation in solids, Vancouver Island, Canada, 21 Aug-2 Sep 1983) | | | |
| 1 | *See* LA-UR-83-2982 | DE84001708 | MN -25 | 9:2711 |
| CONF-8308133- | (Workshop on synthetic metals, Los Alamos, NM, USA, 20-23 Aug 1983) | | | |
| 1 | *See* LA-UR-83-3014 | DE84001704 | MN -34A | 9:3541 |
| CONF-8308136- | (Solar seismology from space conference, Snowmass, CO, USA, 17 Sep-19 Aug 1983) | | | |
| 1 | *See* LA-UR-83-2896 | DE84001867 | MN -34B | 9:3457 |
| CONF-8308140- | (10. international DOE neutron dosimetry workshop, Acapulco, Mexico, 30 Aug-2 Sep 1983) | | | |
| 1 | *See* UCRL-89632 | DE84002467 | MN -41 | 9:3201 |
| CONF-830901- | (Anticipated and abnormal plant transients in light water reactors conference, Jackson, WY, USA, 26-29 Sep 1983) | | | |
| 8 | *See* SAND-83-2080C | DE84000043 | MN -78 | 9:2456 |
| CONF-830905- | (Joint power generation conference, Indianapolis, IN, USA, 25-29 Sep 1983) | | | |
| 6 | NTIS, PC A02/MF A01; 1 | DE83017876 | MN -95f | 9:2190 |
| CONF-830911- | (5. international conference on high power particle beams, San Francisco, CA, USA, 12-14 Sep 1983) | | | |
| 34 | *See* UCRL-88921 | DE84002453 | MN -28 | 9:3143 |
| CONF-830920- | (7. symposium on sources and ion assisted technology and 4. international conference on ion and plasma assisted techniques, Kyoto, Japan, 12-16 Sep 1983) | | | |
| 10 | *See* HEDL-SA-2987 | DE84001464 | MN -20c | 9:4160 |
| CONF-830942- | (3. topical meeting on fusion reactor materials, Albuquerque, NM, USA, 19-23 Sep 1983) | | | |
| 58 | *See* HEDL-SA-2912-FP | DE84002115 | MN -20c | 9:2689 |
| CONF-830950- | (2. international statistical database management workshop, Los Altos, CA, USA, 27-29 Sep 1983) | | | |
| 3 | *See* PNL-SA-11539 | DE84002581 | MN -32 | 9:4263 |
| CONF-830969- | (12. international conference on solid state nuclear track detectors, Acapulco, Mexico, 4-10 Sep 1983) | | | |
| 7 | *See* HEDL-SA-2860-FP | DE84001476 | MN -78 | 9:2205 |
| 8 | *See* HEDL-SA-2858-FP | DE84001483 | MN -78 | 9:2338 |
| CONF-830970- | (International symposium on highly excited states and nuclear structure, Orsay, France, 5-8 Sep 1983) | | | |
| 3 | *See* DOE/ER/40048-73-L3 | DE84001549 | MN -34C | 9:3891 |
| 4 | *See* LA-UR-83-2927 | DE84001908 | MN -34C | 9:3914 |
| CONF-830982- | (National conference on utility conservation programs: planning, analysis, implementation, New Orleans, LA, USA, 13-15 Sep 1983) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84001962 | MN -95d | 9:2594 |
| CONF-830990- | (Solar thermal research workshop, Atlanta, GA, USA, 7-8 Sep 1983) | | | |
| 2 | *See* SERI/TP-255-2091 | DE84000016 | MN -62e | 9:2149 |
| CONF-8309124- | (1. international conference on the chemistry and technology of the lanthanides and actinides, Venice, Italy, 5-10 Sep 1983) | | | |
| 3 | *See* LBL-16569 | DE84001044 | MN -4 | 9:2915 |
| CONF-8309125- | (Annual practical conference on communication, Knoxville, TN, USA, 29 Sep-1 Oct 1983) | | | |
| 2 | NTIS, PC A02/MF A01 | DE84002805 | MN -13 | 9:4239 |
| CONF-8309127- | (International Nuclear Target Society workshop, Argonne, IL, USA, 7-9 Sep 1983) | | | |
| 4 | *See* DOE/ER/40048-77-L3 | DE84001543 | MN -34C | 9:3148 |
| 5 | NTIS, PC A03/MF A01; 1 | DE84000681 | MN -28 | 9:3147 |
| CONF-8309153- | (Seminar on measurements and calculations on the replica of Little Boy, Los Alamos, NM, USA, 13-14 Sep 1983) | | | |
| 2 | *See* UCRL-89797 | DE84002469 | MN -38 | 9:2396 |
| CONF-8309163- | (Conference on low energy tests of conservation laws in particle physics, Blacksburg, VA, USA, 12-14 Sep 1983) | | | |
| 2 | *See* LA-UR-83-3096 | DE84001748 | MN -34D | 9:3712 |
| CONF-8309168- | (3. international conference on ultra-relativistic nucleus-nucleus collisions, Upton, NY, USA, 26-30 Sep 1983) | | | |
| 1 | *See* LA-UR-83-3067 | DE84001726 | MN -34D | 9:3776 |
| CONF-8309169- | (15. international summer school in nuclear physics, Mikolajki, Poland, 5-17 Sep 1983) | | | |
| 1 | *See* DOE/ER/40048-73-L3 | DE84001549 | MN -34C | 9:3891 |
| CONF-8309170- | (Symposium on the use of nonstandard subsized specimens for irradiated testing, Albuquerque, NM, USA, 23 Sep 1983) | | | |
| 1 | *See* HEDL-SA-2909-FP | DE84001484 | MN -25 | 9:2688 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 3 | *See* HEDL-SA-2913 | DE84001470 | MN -20c | 9:2690 |
| 4 | *See* HEDL-SA-2984-FP | DE84001468 | MN -25 | 9:3094 |
| **CONF-8309174-** | (5. international seminar applications of science in examination of works of art, Boston, MA, USA, 7-9 Sep 1983) | | | |
| 2 | *See* BNL-33840 | DE84002694 | MN -13 | 9:2889 |
| **CONF-8309176-** | (17. ESLAB symposium on spacecraft-plasma interactions and their influence on field and particle measurements, Novrdwijk, Netherlands, 1 Sep 1983) | | | |
| 1 | *See* LA-UR-83-2887 | DE84001661 | MN -34B | 9:3456 |
| **CONF-8309180-** | (6. technical workshop on thermochemical processes, Ispra, Italy, 26-29 Sep 1983) | | | |
| 1 | *See* LA-UR-83-2761 | DE84001313 | MN -4 | 9:2115 |
| **CONF-8309182-** | (PATRAM '83, New Orleans, LA, USA, 27 Sep 1983) | | | |
| 1 | *See* SAND-83-0866C | DE84000044 | MN -71 | 9:1944 |
| **CONF-831015-** | (Nuclear science symposium, San Francisco, CA, USA, 19-21 Oct 1983) | | | |
| 14 | *See* BNL-33859 | DE84002696 | MN -28 | 9:3168 |
| 15 | *See* SLAC-PUB-3235 | DE84002759 | MN -28 | 9:3198 |
| 16 | *See* SLAC-PUB-3237 | DE84002761 | MN -28 | 9:3200 |
| 17 | *See* SLAC-PUB-3236 | DE84002760 | MN -28 | 9:3199 |
| 18 | *See* UCRL-89969 | DE84002785 | MN -32 | 9:4254 |
| 19 | *See* UCRL-89894 | DE84002459 | MN -38 | 9:4253 |
| **CONF-831025-** | (26. ORNL-DOE conference on analytical chemistry in energy technology, Knoxville, TN, USA, 11-13 Oct 1983) | | | |
| 21 | *See* LA-UR-83-3012 | DE84001705 | MN -34A | 9:3194 |
| 22 | *See* K/PS-5027 | DE84002430 | MN -11 | 9:3279 |
| 23 | *See* MLM-3112(OP) | DE84002831 | MN -34 | 9:2901 |
| 24 | *See* K/PS-5013-EA | DE84002117 | MN -4 | 9:2895 |
| **CONF-831041-** | (1983 Geothermal Resources Council's annual meeting, Portland, OR, USA, 24-27 Oct 1983) | | | |
| 17 | *See* EGG-M-11583 | DE84002227 | MN -66g | 9:2180 |
| 18 | *See* EGG-M-14483 | DE84002226 | MN -66f | 9:2169 |
| 19 | *See* EGG-M-11683 | DE84002201 | MN -66a | 9:2171 |
| **CONF-831047-** | (American Nuclear Society winter meeting, San Francisco, CA, USA, 30 Oct-4 Nov 1983) | | | |
| 95 | *See* PNL-SA-11441 | DE84002587 | MN -70B | 9:2066 |
| 104 | *See* EGG-M-13283 | DE84002219 | MN -70B | 9:1950 |
| 105 | *See* EGG-M-12383 | DE84002220 | MN -70B | 9:1949 |
| **CONF-831063-** | (American Institute of Chemical Engineers fall annual meeting, Washington, DC, USA, 30 Oct-3 Nov 1983) | | | |
| 5 | *See* DP-MS-83-107 | DE84002429 | MN -70 | 9:1948 |
| 6 | *See* DP-MS-83-109 | DE84002664 | MN -4 | 9:2892 |
| 7 | *See* EGG-M-03283 | DE84002766 | MN -95f | 9:2649 |
| **CONF-831077-** | (Short course on pressure vessel design and fabrication, San Diego, CA, USA, 10-13 Oct 1983) | | | |
| 1 | *See* LA-UR-83-3071 | DE84001728 | MN -66d | 9:2174 |
| **CONF-8310102-** | (Instrument Society of America conference and exhibit, Houston, TX, USA, 10-13 Oct 1983) | | | |
| 2 | NTIS, PC A03/MF A01; 1 | DE84001984 | MN -77 | 9:2282 |
| **CONF-8310143-** | (11. NRC water reactor safety research information meeting, Gaithersburg, MD, USA, 14-28 Oct 1983) | | | |
| 3 | *See* BNL-NUREG-33665 | DE83014024 | MN -78 | 9:2403 |
| 8 | *See* SAND-83-2252C | DE84001759 | MN -80 | 9:2459 |
| 22 | *See* SAND-83-1829C | DE84002540 | MN -78 | 9:2451 |
| 24 | *See* SAND-83-1890C | DE84002041 | MN -78 | 9:2455 |
| 25 | *See* UCRL-86246 | DE84002713 | MN -80 | 9:2212 |
| 26 | *See* SAND-83-1852C | DE84002045 | MN -78 | 9:2453 |
| 28 | *See* SAND-83-1851C | DE84002043 | MN -78 | 9:2452 |
| 29 | *See* SAND-83-1881C | DE84002538 | MN -78 | 9:2454 |
| 30 | *See* PNL-SA-11536 | DE84002596 | MN -78 | 9:2450 |
| 31 | *See* SAND-83-2251C | DE84002384 | MN -80 | 9:2458 |
| 32 | *See* SAND-83-2245C | DE84002040 | MN -78 | 9:2457 |
| **CONF-8310148-** | (Los Alamos/CEA high explosives and detonation physics conference, Paris, France, 3-6 Oct 1983) | | | |
| 11 | *See* LA-UR-83-2847 | DE84001172 | MN -45 | 9:3229 |
| **CONF-8310174-** | (Forest environmental measurements conference, Oak Ridge, TN, USA, 23-28 Oct 1983) | | | |
| 2 | *See* DP-MS-83-14 | DE84001952 | MN -11 | 9:3265 |
| **CONF-8310177-** | (2. annual DOE geothermal progress review meeting, Washington, DC, USA, 11-12 Oct 1983) | | | |
| 2 | *See* LA-UR-83-3072 | DE84001727 | MN -66d | 9:2175 |
| **CONF-8310178-** | (2. international conference and workshop on radiative properties of hot dense matter, Sarasota, FL, USA, 31 Oct-4 Nov 1983) | | | |
| 1 | *See* LA-UR-83-3095 | DE84001721 | MN -34C | 9:3542 |
| 2 | *See* UCRL-89923 | DE84001781 | MN -4 | 9:3089 |
| **CONF-8310179-** | (8. international symposium on polynuclear aromatic hydrocarbons, Columbus, OH, USA, 26-28 Oct 1983) | | | |
| 1 | *See* LA-UR-83-3110 | DE84001747 | MN -48 | 9:3417 |
| **CONF-8310182-** | (US fall DECUS symposium, Las Vegas, NV, USA, 24-28 Oct 1983) | | | |
| 1 | *See* LA-UR-83-2979 | DE84001706 | MN -32 | 9:4260 |
| 3 | *See* LA-UR-83-2980 | DE84001707 | MN -32 | 9:4261 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| CONF-8310187- | (IEEE ultrasonics symposium, Atlanta, GA, USA, 31 Oct-2 Nov 1983) | | | |
| 2 | *See* UCRL-89397 | DE84002714 | MN -34 | 9:4021 |
| CONF-8310188- | (5. molecular beam epitaxy workshop, Atlanta, GA, USA, 6-7 Oct 1983) | | | |
| 1 | *See* SAND-83-2148C | DE84001055 | MN -25 | 9:3215 |
| CONF-8310194- | (Asilomar conference on circuits, systems and computers, Pacific Grove, CA, USA, 31 Oct-2 Nov 1983) | | | |
| 2 | *See* SAND-83-2298C | DE84001768 | MN -38 | 9:3106 |
| CONF-8310195- | (Industrial wood energy forum, Nashville, TN, USA, 15 Oct 1983) | | | |
| 1 | *See* PNL-SA-11447 | DE84002595 | MN -61 | 9:2086 |
| CONF-8310198- | (IAEA specialists on mechanical properties of structural materials, Chester, UK, 10-14 Oct 1983) | | | |
| 1 | *See* HEDL-SA-2982 | DE84001467 | MN -25 | 9:2691 |
| CONF-8310204- | (DNA hilat/late time meeting, Palo Alto, CA, USA, 5-8 Oct 1983) | | | |
| 1 | *See* LA-UR-83-2997 | DE84001709 | MN -34B | 9:3504 |
| CONF-8310206- | (Water Pollution Control Federation annual conference, Atlanta, GA, USA, 2-6 Oct 1983) | | | |
| 1 | NTIS, PC A02/MF A01 | DE84001961 | MN -11 | 9:3331 |
| CONF-8310207- | (Workshop on perspectives in nuclear physics at intermediate energies, Trieste, Italy, 10-14 Oct 1983) | | | |
| 1 | *See* LA-UR-83-2763 | DE84001314 | MN -34C | 9:3872 |
| CONF-8310210- | (14. TVA fertilizer conference on new developments in fertilizer technology, Muscle Shoals, AL, USA, 5-6 Oct 1983) | | | |
| | *See* TVA/OACD-83/15 | DE84900074 | MN -13 | 9:2545 |
| CONF-8310211- | (USE conference, Orlando, FL, USA, 4 Oct 1983) | | | |
| 1 | *See* SAND-83-1401C | DE84001790 | MN -32 | 9:4249 |
| CONF-831111- | (ASME winter annual meeting, Boston, MA, USA, 13-18 Nov 1983) | | | |
| 10 | NTIS, PC A02/MF A01; 1 | DE84002738 | MN -79 | 9:2281 |
| CONF-831155- | (Symposium on flue gas desulfurization, New Orleans, LA, USA, 1-4 Nov 1983) | | | |
| 1 | *See* TVA/PUB-84/6 | DE84900355 | MN -90i | 9:1804 |
| CONF-831171- | (American Vacuum Society meeting, Boston, MA, USA, 1-4 Nov 1983) | | | |
| 12 | *See* UCRL-89327 | DE84002722 | MN -20 | 9:4198 |
| 13 | *See* BNL-33685 | DE84001208 | MN -34A | 9:3514 |
| CONF-831174- | (Materials Research Society annual meeting, Boston, MA, USA, 14-17 Nov 1983) | | | |
| 8 | *See* SAND-83-1409C | DE84002802 | MN -34A | 9:3971 |
| 9 | *See* SAND-83-1418C | DE84002107 | MN -34 | 9:2834 |
| 10 | *See* SAND-83-2276C | DE84002611 | MN -25 | 9:2835 |
| CONF-831180- | (3. international symposium on the production and neutralization of negative ions and beams, Upton, NY, USA, 14-18 Nov 1983) | | | |
| 1 | *See* UCRL-89844 | DE84002727 | MN -20 | 9:4199 |
| 3 | *See* UCRL-89993 | DE84003021 | MN -34A | 9:3546 |
| CONF-831191- | (Quantitative surface analysis conference, Teddington, UK, 22-24 Nov 1983) | | | |
| 1 | *See* SAND-83-2234C | DE84002537 | MN -25 | 9:2904 |
| CONF-831195- | (International congress on applications of lasers and electro-optics, Los Angeles, CA, USA, 14-17 Nov 1983) | | | |
| 1 | *See* UCRL-89307 | DE84001782 | MN -92 | 9:1887 |
| 2 | *See* UCRL-89570 | DE84002780 | MN -21 | 9:4084 |
| CONF-831199- | (3. Electric Power Research Institute annual contractors' conference on coal gasification, Palo Alto, CA, USA, 2-3 Nov 1983) | | | |
| 1-PT.1 | NTIS, PC A03/MF A01 | DE84001527 | MN -90c | 9:1757 |
| CONF-8311100- | (12. international conference on global environmental problems, Chicago, IL, USA, 24-27 Nov 1983) | | | |
| 1 | *See* UCRL-89964 | DE84002723 | MN -11 | 9:3274 |
| CONF-8311101- | (12. CAM-I annual meeting and technical conference, Dallas, TX, USA, 8-10 Nov 1983) | | | |
| 1 | *See* SAND-83-2164C | DE84000942 | MN -32 | 9:4250 |
| CONF-831203- | (10. symposium on fusion engineering, Philadelphia, PA, USA, 5-9 Dec 1983) | | | |
| 1 | *See* UCRL-89195 | DE83018180 | MN -20c | 9:4197 |
| CONF-831235- | (22. IEEE conference on decision control, San Antonio, TX, USA, 14 Dec 1983) | | | |
| 2 | NTIS, PC A02/MF A01 | DE84000587 | MN -79p | 9:2406 |
| COO- | | | | |
| 2313-13 | *See* DOE/ER/02313-13 | DE84003011 | MN -25 | 9:2680 |
| CRN-CPR- | | | | |
| 83-02 | NTIS (US Sales Only), MF A01; 2 | DE84750177 | MN -59c | 9:2106 |
| CRN-PN- | | | | |
| 82-28 | NTIS (US Sales Only), PC A03/MF A01 | DE83703786 | MN -37 | 9:3171 |
| CTA-EAV- | | | | |
| 001/ 81 | NTIS (US Sales Only), PC A02/MF A01 | DE83704288 | MN -34C | 9:3926 |
| DESY- | | | | |
| 83-005 | NTIS (US Sales Only), PC A03/MF A01 | DE83751355 | MN -28 | 9:3136 |
| 83-032 | NTIS (US Sales Only), PC A02/MF A01 | DE83751354 | MN -28 | 9:3137 |
| 83-034 | NTIS (US Sales Only), PC A02/MF A01 | DE83751350 | MN -34D | 9:3625 |
| 83-037 | NTIS (US Sales Only), PC A02/MF A01 | DE83751352 | MN -34D | 9:3626 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 83-039 | NTIS (US Sales Only), PC A02/MF A01 | DE83751353 | MN -34D | 9:3627 |
| DOE/BC/10316-26 | NTIS, PC A07/MF A01; 1 | DE84001228 | STD -92a | 9:1825 |
| DOE/BP-189 | NTIS, PC A07/MF A01; 1 | DE84002335 | MN -11 | 9:3259 |
| DOE/CE-0108 | NTIS, PC A05/MF A01 | DE84002954 | STD -66 | 9:2154 |
| DOE/CE/15095-4 | NTIS, PC A03/MF A01 | DE84002744 | STD -95 | 9:2608 |
| 5 | NTIS, PC A03/MF A01 - GPO | DE84002149 | STD -63 | 9:2136 |
| DOE/CE/15146-T3 | NTIS, PC A02/MF A01 | DE83016306 | MN -95 | 9:2643 |
| DOE/CE/30741-T1 | NTIS, PC A07/MF A01 | DE84001150 | MN -59a | 9:2145 |
| DOE/CR/10004-1 | NTIS, PC A05/MF A01; 1 | DE84002339 | MN -90j | 9:1758 |
| DOE/CS/15061-T1 | NTIS, PC A02/MF A01 | DE84001805 | MN -95f | 9:2644 |
| DOE/CS/15066-T1 | NTIS, PC A03/MF A01; 1 | DE84002071 | MN -95d | 9:2645 |
| DOE/CS/15072-T5 | NTIS, PC A03/MF A01; 1 | DE84001590 | STD -62 | 9:2148 |
| DOE/CS/20050-1 | NTIS, PC A07/MF A01 | DE84002311 | STD -95d | 9:2609 |
| DOE/CS/20173-T1 | NTIS, PC A02/MF A01 | DE84002127 | MN -95 | 9:2666 |
| DOE/CS/20177-T1 | NTIS, PC A06/MF A01; 1 | DE83015350 | MN -95 | 9:2610 |
| DOE/CS/20230-1 | NTIS, PC A09/MF A01; 1 | DE84002615 | STD -95e | 9:2661 |
| DOE/CS/20271-2 | NTIS, PC A08/MF A01; 1 | DE84002144 | MN -95e | 9:2611 |
| DOE/CS/20396-T1 | NTIS, PC A02/MF A01 | DE84002135 | MN -95 | 9:2595 |
| DOE/CS/20524-1-Draft | D; 2 | DE84001739 | MN -95d | 9:2612 |
| 2-Draft | NTIS, PC A03/MF A01; 1 | DE84001740 | MN -95d | 9:2613 |
| 4-Draft | NTIS, PC A18/MF A01 | DE84001742 | MN -95d | 9:2614 |
| 5-Draft | NTIS, PC A07/MF A01; 1 | DE84001743 | MN -95d | 9:2615 |
| DOE/CS/24315-20 | NTIS, PC A04/MF A01; 1 | DE84002608 | STD -95e | 9:2646 |
| DOE/CS/50007-T2 | NTIS, PC A14/MF A01 | DE84002903 | MN -96 | 9:2647 |
| DOE/DP-0001/ 12 | NTIS, PC A02/MF A01 | DE84002221 | STD -16 | 9:2056 |
| DOE/EA-0221 | NTIS, PC A05/MF A01; 1 | DE84002751 | STD -90 | 9:2191 |
| DOE/EI/02295-1 | NTIS MF A01; 2 | DE84001620 | MN -97c | 9:2566 |
| DOE/EI/08607-T1 | NTIS, PC A07/MF A01 | DE84002235 | MN -98 | 9:2537 |
| DOE/EI/19624-T1 | NTIS, PC A02/MF A01; 1 | DE84001087 | MN -98B | 9:1856 |
| DOE/EIA-0413 | NTIS, PC A03/MF A01 - GPO | DE84002151 | MN -98A | 9:1815 |
| 0419 | NTIS, PC A06/MF A01 - GPO | DE84002336 | MN -98C | 9:1882 |
| DOE/EP-0058/ 1 | NTIS, PC A04/MF A01; 1 | DE84002752 | MN -11 | 9:3326 |
| DOE/EP/16004-T1 | NTIS, PC A02/MF A01 | DE84002286 | MN -13 | 9:4240 |
| DOE/ER/01713-T2 | NTIS, PC A02/MF A01 | DE84002603 | MN -4 | 9:2914 |
| DOE/ER/02313-13 | NTIS, PC A05/MF A01; 1 | DE84003011 | MN -25 | 9:2680 |
| DOE/ER/02853-20 | NTIS, PC A03/MF A01; 1 | DE84002648 | MN -34C | 9:3904 |
| DOE/ER/02887-T1 | NTIS, PC A02/MF A01 | DE84002279 | MN -34A | 9:3515 |
| DOE/ER/03992-526 | NTIS, PC A03/MF A01; 1 | DE84002842 | MN -34D | 9:3827 |
| 529 | NTIS, PC A03/MF A01 | DE84002845 | MN -34D | 9:4003 |
| 530 | NTIS, PC A02/MF A01 | DE84002844 | MN -34D | 9:4004 |
| 531 | NTIS, PC A02/MF A01 | DE84002848 | MN -34D | 9:4005 |
| 0527 | NTIS, PC A02/MF A01 | DE84002843 | MN -34D | 9:3740 |
| DOE/ER/05224-7 | NTIS, PC A02/MF A01; 1 | DE84002583 | MN -34C | 9:3862 |
| DOE/ER/10058-T1 | NTIS, PC A12/MF A01; 1 | DE83017906 | MN -4 | 9:4238 |
| DOE/ER/10371-5 | NTIS, PC A02/MF A01 | DE84002653 | MN -34A | 9:3516 |
| DOE/ER/10570-T2 | NTIS, PC A02/MF A01 | DE83018126 | MN -25 | 9:2681 |
| DOE/ER/10581-T2 | NTIS, PC A02/MF A01; 1 | DE84001273 | MN -48 | 9:3350 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| DOE/ER/10597-2 | NTIS, PC A02/MF A01 | DE84002438 | MN -94cc | 9:2524 |
| DOE/ER/10599-21 | NTIS, PC A02/MF A01 | DE84002643 | MN -34C | 9:3922 |
| DOE/ER/10612-9 | NTIS, PC A05/MF A01 | DE84002436 | MN -4 | 9:2977 |
| DOE/ER/10618-10 | NTIS, PC A02/MF A01 | DE84002628 | MN -34A | 9:3517 |
| DOE/ER/10755-3 | NTIS, PC A02/MF A01 | DE84003009 | MN -4 | 9:3005 |
| DOE/ER/10811-83 | NTIS, PC A02/MF A01 | DE84003018 | MN -4 | 9:3209 |
| DOE/ER/10815-2 | NTIS, PC A02/MF A01 | DE84002639 | MN -4 | 9:3006 |
| DOE/ER/10956-5 | NTIS, PC A03/MF A01; 1 | DE84003015 | MN -25 | 9:2780 |
| 6 | NTIS, PC A02/MF A01 | DE84002964 | MN -25 | 9:2682 |
| DOE/ER/40012-T1 | NTIS, PC A02/MF A01 | DE84001881 | MN -34D | 9:3172 |
| DOE/ER/40048-22-N3 | NTIS, PC A02/MF A01; 1 | DE84001542 | MN -34D | 9:3741 |
| 73-L3 | NTIS, PC A03/MF A01; 1 | DE84001549 | MN -34C | 9:3891 |
| 77-L3 | NTIS, PC A02/MF A01 | DE84001543 | MN -34C | 9:3148 |
| DOE/ER/40097-1 | NTIS, PC A02/MF A01; 1 | DE84001129 | MN -34C | 9:3905 |
| DOE/ER/45025-2 | NTIS, PC A02/MF A01 | DE84002768 | MN -34 | 9:2683 |
| DOE/ER/52061-1 | NTIS, PC A06/MF A01; 1 | DE83017148 | MN -20 | 9:4153 |
| DOE/ER/53111-1 | NTIS, PC A02/MF A01; 1 | DE83016801 | MN -20g | 9:4046 |
| 2 | NTIS, PC A02/MF A01 | DE83016802 | MN -20g | 9:4154 |
| DOE/ER/53112-T1 | NTIS, PC A02/MF A01 | DE83016541 | MN -20f | 9:4047 |
| DOE/ER/53140-10 | NTIS, PC A02/MF A01 | DE84002356 | MN -20g | 9:4048 |
| DOE/ER/53150-T2 | NTIS, PC A02/MF A01 | DE84002124 | MN -20b | 9:4049 |
| DOE/ER/54010-T1 | NTIS, PC A02/MF A01; 1 | DE83016756 | MN -20a | 9:4050 |
| DOE/ER/60055-T1 | NTIS, PC A02/MF A01 | DE84000582 | MN -4 | 9:3264 |
| DOE/ER/60076-1 | NTIS, PC A03/MF A01; 1 | DE84002342 | MN -48 | 9:3410 |
| DOE/ET/10143-13 | NTIS MF A01; 2 | DE83012487 | STD -90d | 9:1759 |
| 19-Rev. | NTIS, PC A08/MF A01; 1 | DE84002450 | STD -90d | 9:1760 |
| 42 | NTIS, PC A16/MF A01; 1 | DE84002588 | STD -90d | 9:1761 |
| DOE/ET/10393-1461 | NTIS, PC A03/MF A01; 1 | DE83015484 | STD -90e | 9:3113 |
| DOE/ET/10612-T1 | NTIS, PC A04/MF A01 | DE84002251 | MN -92a | 9:1826 |
| DOE/ET/13148-2 | NTIS, PC A07/MF A01; 1 | DE84002701 | STD -95e | 9:2648 |
| DOE/ET/15602-T6 | NTIS, PC A02/MF A01 | DE84001098 | MN -90g | 9:2579 |
| DOE/ET/15614-8 | NTIS, PC A04/MF A01 | DE84002026 | STD -90g | 9:2580 |
| 9 | NTIS, PC A05/MF A01 | DE84002028 | STD -90g | 9:2581 |
| 10 | NTIS, PC A04/MF A01 | DE84002029 | STD -90g | 9:2582 |
| 11 | NTIS, PC A04/MF A01 | DE84002037 | STD -90g | 9:2583 |
| 13 | NTIS, PC A06/MF A01 | DE84002025 | STD -90g | 9:2584 |
| 14 | NTIS, PC A05/MF A01 | DE84002027 | STD -90g | 9:2585 |
| 15 | NTIS, PC A05/MF A01 | DE84002030 | STD -90g | 9:2586 |
| 16 | NTIS, PC A04/MF A01 | DE84002031 | STD -90g | 9:2587 |
| DOE/ET/20320-T1 | NTIS, PC A03/MF A01 | DE83011009 | MN -60 | 9:2187 |
| DOE/ET/20488-T1 | NTIS, PC A07/MF A01; 1 | DE84002393 | MN -64 | 9:2181 |
| DOE/ET/20585-T1 | NTIS, PC A02/MF A01; 1 | DE84001610 | MN -61a | 9:2107 |
| DOE/ET/27184-T1 | NTIS, PC A03/MF A01 | DE84002606 | MN -66 | 9:2170 |
| DOE/ET/27256-T38 | NTIS, PC A02/MF A01 | DE84001855 | MN -66g | 9:2177 |
| DOE/ET/29033-1 | NTIS, PC A08/MF A01; 1 | DE84001492 | MN -97c | 9:2567 |
| DOE/ET/29034-1 | NTIS MF A01; 2 | DE84001621 | MN -97d | 9:2568 |
| DOE/ET/29035-1 | NTIS, PC A05/MF A01; 1 | DE84001637 | MN -97c | 9:2569 |
| DOE/ET/34006-9 | NTIS (US Sales Only), PC A06/MF A01 | DE84000853 | STD -78 | 9:2201 |
| DOE/ET/34020-4 | NTIS (US Sales Only), PC A03/MF A01 | DE84002350 | STD -78 | 9:2222 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| DOE/ET/34072-2 | NTIS (US Sales Only), PC A04/MF A01 | DE84002326 | STD -78 | 9:2315 |
| DOE/ET/34212-40 | NTIS (US Sales Only), PC A04/MF A01 | DE84002333 | STD -78 | 9:2223 |
| DOE/ET/37249-1 | NTIS, PC A02/MF A01 | DE84003022 | MN -25 | 9:2684 |
| DOE/ET/44614-T5 | NTIS, PC A03/MF A01 | DE84001668 | MN -92a | 9:1820 |
| DOE/ET/51013-100 | NTIS, PC A10/MF A01 | DE84002809 | MN -20g | 9:4051 |
| DOE/ET/52017-T1 | NTIS, PC A06/MF A01 | DE84002366 | MN -20 | 9:4155 |
| DOE/ET/53001-4 | NTIS, PC A03/MF A01 | DE84001134 | MN -20 | 9:4052 |
| DOE/ET/53045-7 | NTIS, PC A02/MF A01 | DE84002638 | MN -20g | 9:4053 |
| DOE/ET/53088-102 | NTIS, PC A02/MF A01 | DE84001559 | MN -20 | 9:4156 |
| 107 | NTIS, PC A02/MF A01 | DE84001560 | MN -20b | 9:4157 |
| 110 | NTIS, PC A02/MF A01 | DE84001556 | MN -20a | 9:4054 |
| DOE/EV/00900-6 | NTIS, PC A03/MF A01 | DE84002649 | MN -12 | 9:3408 |
| DOE/EV/03018-247 | NTIS, PC A05/MF A01; 1 | DE83017404 | MN -4 | 9:3007 |
| DOE/EV/04472-T3 | NTIS, PC A03/MF A01 | DE84000837 | MN -48 | 9:3392 |
| DOE/ID-10115 | NTIS, PC A05/MF A01 | DE84002765 | MN -61a | 9:2089 |
| 12098 | NTIS, PC A19/MF A01; 1 | DE83016956 | STD -11 | 9:3294 |
| DOE/JPL-1012/ 81 | *See* N-8325034 | | | 9:2123 |
| DOE/JPL/956205-83/ 5 | NTIS, PC A02/MF A01; 1 | DE84000253 | STD -63b | 9:2108 |
| DOE/LC/10962-1 | NTIS, PC A07/MF A01 | DE83016121 | STD -91 | 9:1907 |
| DOE/METC-83-45 | NTIS, PC A06/MF A01; 1 | DE84000306 | STD -92 | 9:1888 |
| DOE/NASA/0250-1 | NTIS, PC A03/MF A01; 1 | DE84002143 | STD -94cb | 9:2525 |
| DOE/NASA/0254-1 | NTIS, PC A12/MF A01; 1 | DE84002197 | STD -96 | 9:2671 |
| DOE/NASA/17088-4 | NTIS, PC A04/MF A01 | DE84002166 | STD -93 | 9:2590 |
| DOE/NBB-0046 | NTIS, PC A07/MF A01 | DE84001602 | MN -98 | 9:2538 |
| DOE/NBM-4000571 | NTIS, PC A02/MF A01 | DE84000571 | MN -4 | 9:3351 |
| DOE/NV/00410-80 | D; 2 | DE84002803 | MN -13 | 9:2541 |
| DOE/PC/30013-4 | NTIS, PC A12/MF A01 | DE84000539 | STD -90a | 9:1789 |
| DOE/PC/30185-T1 | NTIS, PC A02/MF A01; 1 | DE84002126 | MN -90e | 9:3114 |
| T2 | NTIS, PC A03/MF A01; 1 | DE84002123 | MN -90e | 9:3115 |
| DOE/PC/30209-T5 | NTIS, PC A03/MF A01 | DE84002401 | MN -90d | 9:1762 |
| DOE/PC/30238-T1 | NTIS, PC A06/MF A01 | DE84001859 | STD -90i | 9:1797 |
| DOE/PC/30249-T6 | NTIS, PC A06/MF A01; 1 | DE84002734 | STD -90a | 9:1790 |
| DOE/PC/40781-T8 | NTIS, PC A02/MF A01 | DE84001764 | MN -90d | 9:1763 |
| DOE/PC/40782-T5 | NTIS, PC A02/MF A01 | DE83013607 | MN -90a | 9:1764 |
| DOE/PC/40783-T12 | NTIS, PC A02/MF A01 | DE84002604 | STD -90a | 9:1791 |
| DOE/PC/40797-T1 | NTIS, PC A03/MF A01; 1 | DE84000331 | MN -90d | 9:1765 |
| DOE/PC/41265-T1 | NTIS MF A01; 2 | DE84001112 | MN -90a | 9:2076 |
| DOE/PC/41755-T1 | NTIS, PC A02/MF A01 | DE84002154 | STD -90d | 9:1766 |
| DOE/PC/50051-T3 | NTIS, PC A07/MF A01; 1 | DE84001663 | STD -90d | 9:1767 |
| DOE/PC/50057-T4 | NTIS, PC A23/MF A01 | DE84002642 | STD -90d | 9:1768 |
| DOE/PC/50793-T1 | NTIS, PC A02/MF A01 | DE83013233 | MN -90a | 9:1769 |
| T2 | NTIS, PC A02/MF A01 | DE83013440 | MN -90a | 9:1770 |
| T4 | NTIS, PC A03/MF A01 | DE84001012 | MN -90a | 9:1771 |
| DOE/PC/50811-T2 | NTIS, PC A02/MF A01 | DE84002732 | MN -90d | 9:1792 |
| DOE/PC/60796-1 | NTIS, PC A02/MF A01 | DE84002764 | MN -90a | 9:1772 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| **DOE/R4/10154-** | | | | |
| T1 | NTIS, PC A02/MF A01 | DE84000763 | MN -96 | 9:2637 |
| **DOE/R4/10157-** | | | | |
| T1 | NTIS, PC A02/MF A01; 1 | DE84000710 | MN -66g | 9:2178 |
| **DOE/RG/09154-** | | | | |
| T2 | NTIS MF A01; 2 | DE83017330 | MN -97 | 9:2570 |
| **DOE/RG/10174-** | | | | |
| T1 | NTIS, PC A04/MF A01 | DE84002691 | MN -98E | 9:2571 |
| **DOE-RW-** | | | | |
| 83.013 | *See* AERE-G-2599 | DE83703804 | MN -70 | 9:1945 |
| **DOE/SF/01264-** | | | | |
| T1 | NTIS, PC A11/MF A01; 1 | DE84002810 | MN -93 | 9:2591 |
| **DOE/SF/01326-** | | | | |
| T5 | NTIS, PC A12/MF A01; 1 | DE84002616 | MN -66a | 9:2179 |
| T6 | NTIS, PC A11/MF A01 | DE84002617 | MN -66a | 9:2168 |
| **DOE-tr-** | | | | |
| 258 | NTIS, PC A02/MF A01 | DE84002813 | MN -25 | 9:2966 |
| 4002814 | NTIS, PC A02/MF A01 | DE84002814 | MN -38 | 9:3091 |
| **DP-MS-** | | | | |
| 83-14 | NTIS, PC A02/MF A01 | DE84001952 | MN -11 | 9:3265 |
| 83-31-Rev.1 | NTIS, PC A02/MF A01 | DE84002662 | MN -4 | 9:2891 |
| 83-107 | NTIS, PC A03/MF A01 | DE84002429 | MN -70 | 9:1948 |
| 83-109 | NTIS, PC A03/MF A01; 1 | DE84002664 | MN -4 | 9:2892 |
| **DPST-** | | | | |
| 71-590 | NTIS, PC A02/MF A01 | DE84002057 | MN -80 | 9:2348 |
| 83-736-Vol.2 | NTIS, PC A04/MF A01 | DE84001899 | MN -11 | 9:3342 |
| 83-780 | NTIS, PC A02/MF A01 | DE84002819 | MN -41 | 9:2407 |
| **E-** | | | | |
| 1435 | *See* N-8325036 | | | 9:2672 |
| 1513 | *See* N-8327879 | | | 9:2831 |
| 1549 | *See* N-8325037 | | | 9:2193 |
| 1643 | *See* N-8325038 | | | 9:2527 |
| **ECS-SR-** | | | | |
| 3-Vol.2 | *See* DPST-83-736-Vol.2 | DE84001899 | MN -11 | 9:3342 |
| **EFI-** | | | | |
| 494(37) -81 | NTIS (US Sales Only), PC A02/MF A01 | DE83704005 | MN -34D | 9:3742 |
| 514(1) -82 | NTIS (US Sales Only), PC A02/MF A01 | DE83703984 | MN -34A | 9:3965 |
| 517(4) -82 | NTIS (US Sales Only), PC A02/MF A01 | DE83703969 | MN -34D | 9:3795 |
| 528(15) -82 | NTIS (US Sales Only), PC A02/MF A01 | DE83703985 | MN -34A | 9:2822 |
| 530(17) -82 | NTIS (US Sales Only), PC A02/MF A01 | DE83703970 | MN -34D | 9:3743 |
| 533(20) -82 | NTIS (US Sales Only), PC A03/MF A01 | DE83703971 | MN -34D | 9:3744 |
| 575(62) -82 | NTIS (US Sales Only), PC A03/MF A01 | DE83704002 | MN -34B | 9:3449 |
| **EFI-TR-** | | | | |
| 2742 | NTIS (US Sales Only), PC A03/MF A01 | DE83751459 | MN -97a | 9:2197 |
| 2772 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751461 | MN -98 | 9:2576 |
| **EGG-** | | | | |
| 2267 | *See* NUREG/CR-3417 | DE84002341 | MN -78 | 9:2445 |
| **EGG-FT-** | | | | |
| 6392 | NTIS, PC A09/MF A01 | DE84002521 | MN -20 | 9:4158 |
| **EGG-M-** | | | | |
| 03283 | NTIS, PC A02/MF A01 | DE84002766 | MN -95f | 9:2649 |
| 07083 | NTIS, PC A02/MF A01; 1 | DE84000562 | MN -78 | 9:2408 |
| 08683 | NTIS, PC A02/MF A01 | DE84000564 | MN -78 | 9:2409 |
| 11583 | NTIS, PC A02/MF A01; 1 | DE84002227 | MN -66g | 9:2180 |
| 11683 | NTIS, PC A02/MF A01; 1 | DE84002201 | MN -66a | 9:2171 |
| 12383 | NTIS, PC A02/MF A01 | DE84002220 | MN -70B | 9:1949 |
| 13283 | NTIS, PC A02/MF A01 | DE84002219 | MN -70B | 9:1950 |
| 14483 | NTIS, PC A02/MF A01; 1 | DE84002226 | MN -66f | 9:2169 |
| 24682 | NTIS, PC A02/MF A01 | DE84000662 | MN -78 | 9:2410 |
| 27682 | NTIS, PC A02/MF A01 | DE84000560 | MN -78 | 9:2411 |
| **EGG-PBS-** | | | | |
| 6379 | NTIS, PC A06/MF A01 | DE84002038 | MN -78 | 9:2412 |
| **EPA-** | | | | |
| 600/ 4-83-026 | *See* PB-83-252502 | | | 9:3281 |
| 600/ 8-83-027 | *See* PB-83-251850 | | | 9:1805 |
| 600-D-83-061 | *See* PB-83-243246 | | | 9:3418 |
| 600/ D-83-113 | *See* PB-83-250340 | | | 9:3271 |
| **EUR-** | | | | |
| 6299-EN-FR-Vol.1 | Graham & Trotman Ltd., Bond Street House, 14 Clifford Street, London, W1X 1Rd, England | | | 9:1829 |
| 7338 | NTIS (US Sales Only), PC A05/MF A01 | DE83703805 | MN -70 | 9:1951 |
| 7371 | NTIS (US Sales Only), PC A04/MF A01 | DE83703806 | MN -70 | 9:1952 |
| 7373 | NTIS (US Sales Only), PC A02/MF A01 | DE83703770 | MN -78 | 9:2202 |
| 7599 | NTIS (US Sales Only), PC A12/MF A01 | DE83703771 | MN -78 | 9:2224 |
| 7603 | NTIS (US Sales Only), PC A02/MF A01 | DE83703762 | MN -80 | 9:2203 |
| 7650 | NTIS (US Sales Only), PC A07/MF A01 | DE83703810 | MN -70 | 9:1953 |
| 7654 | NTIS (US Sales Only), PC A05/MF A01 | DE83703807 | MN -70 | 9:1954 |
| 7675 | NTIS (US Sales Only), PC A07/MF A01 | DE83703808 | MN -70 | 9:1955 |
| 7728 | NTIS (US Sales Only), PC A08/MF A01 | DE83703811 | MN -70 | 9:1956 |
| 7836 | NTIS (US Sales Only), PC A07/MF A01 | DE83703816 | MN -32 | 9:2685 |
| 7900 | NTIS (US Sales Only), PC A03/MF A01 | DE83703817 | MN -32 | 9:4246 |
| 7923 | NTIS (US Sales Only), PC A02/MF A01 | DE83703828 | MN -2 | 9:2686 |
| 7926 | NTIS (US Sales Only), PC A02/MF A01 | DE83703829 | MN -2 | 9:3863 |
| 7931 | NTIS (US Sales Only), PC A03/MF A01 | DE83703782 | MN -80 | 9:2381 |
| 7959 | NTIS (US Sales Only), PC A02/MF A01 | DE83703818 | MN -32 | 9:4247 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| 7999 | NTIS (US Sales Only), PC A04/MF A01 | DE83703819 | MN -32 | 9:2676 |
| 8011-EN | *See* PB-83-240861 | | | 9:2903 |
| 8020-EN | *See* PB-83-240879 | | | 9:2000 |
| 8025-DE | *See* PB-83-251488 | | | 9:2074 |
| 8049-EN-Pt.2 | European Community Information Service, 2100 M Street, NW, Suite 707, Washington, DC 20037 | | ND -13 | 9:4241 |
| 8052-EN | *See* PB-83-241968 | | | 9:3270 |
| 8082 | NTIS (US Sales Only), PC A04/MF A01 | DE83703830 | MN -2 | 9:2382 |
| 8160-EN | Available from Commission of the European Communities, Luxembourg | | | 9:2109 |
| 8200-EN | Commission of the European Communities, Luxembourg | | | 9:2137 |
| 8205-EN | Commission of the European Communities, Luxembourg | | | 9:2110 |
| 8247-FR | European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037 | | ND -66 | 9:2172 |
| 8343-EN | *See* PB-83-241562 | | | 9:2448 |
| 8380-EN | NTIS PC E11/MF E11 | | | 9:2162 |
| 8506-EN | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -95 | 9:2616 |
| 8539-FR | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -66 | 9:2517 |
| 8542-EN | Europen Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -95 | 9:2555 |
| 8571-FR | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -63 | 9:2138 |
| 8628-EN | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -95 | 9:2596 |
| 8642-DE | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -25 | 9:2687 |
| 8719-EN-IT | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -66b | 9:2163 |
| 8722-EN-IT | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -66 | 9:2164 |
| 8724-EN | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -66 | 9:2173 |
| 8745-EN | European Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -34B | 9:2101 |
| 8787-DE | European Community Information Service (ECIS), 2100 M Street, N.W., Suite 707, Washington, DC 20037 | | ND -95d | 9:2617 |
| **EUR-CEA-FC-** | | | | |
| 1170 | NTIS (US Sales Only), PC A02/MF A01 | DE84700014 | MN -20 | 9:4055 |
| 1171 | NTIS (US Sales Only), PC A03/MF A01 | DE84700015 | MN -20 | 9:4056 |
| 1173 | NTIS (US Sales Only), PC A08/MF A01 | DE84700016 | MN -20 | 9:4057 |
| **FE-** | | | | |
| 2013-25 | *See* DOE/PC/40781-T8 | DE84001764 | MN -90d | 9:1763 |
| **FEI-** | | | | |
| 1172 | NTIS (US Sales Only), PC A02/MF A01 | DE83703768 | MN -80 | 9:2204 |
| 1282 | NTIS (US Sales Only), PC A02/MF A01 | DE84700061 | MN -46 | 9:3966 |
| 1308 | NTIS (US Sales Only), PC A02/MF A01 | DE84700002 | MN -34D | 9:4006 |
| 1326 | NTIS (US Sales Only), PC A02/MF A01 | DE83703769 | MN -80 | 9:2333 |
| 1336 | NTIS (US Sales Only), PC A02/MF A01 | DE83703763 | MN -80 | 9:2323 |
| 1337 | NTIS (US Sales Only), PC A02/MF A01 | DE83703764 | MN -80 | 9:2324 |
| 1340 | NTIS (US Sales Only), PC A02/MF A01 | DE83703779 | MN -79 | 9:2260 |
| 1347 | NTIS (US Sales Only), PC A02/MF A01 | DE83703787 | MN -37 | 9:3173 |
| **FFI/Notat-** | | | | |
| 80/ 4014 | NTIS (US Sales Only), PC A02/MF A01 | DE83751467 | MN -61a | 9:2094 |
| 80/ 4041 | NTIS (US Sales Only), PC A02/MF A01; 1 | DE83751472 | MN -95d | 9:2650 |
| 80/ 4042 | NTIS (US Sales Only), PC A02/MF A01 | DE83751466 | MN -61a | 9:2095 |
| **FFI-TN-VM-** | | | | |
| 64 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751468 | MN -61a | 9:2077 |
| 325 | NTIS (US Sales Only), PC A03/MF A01 | DE83751471 | MN -61a | 9:2111 |
| 350 | NTIS (US Sales Only), PC A05/MF A01; 1 | DE83751470 | MN -61a | 9:2078 |
| 352 | NTIS (US Sales Only), PC A03/MF A01 | DE83751469 | MN -61a | 9:2079 |
| 380 | NTIS (US Sales Only), PC A02/MF A01 | DE83751475 | MN -95d | 9:3266 |
| 381 | NTIS (US Sales Only), PC A02/MF A01 | DE83751473 | MN -95d | 9:2651 |
| 382 | NTIS (US Sales Only), PC A02/MF A01 | DE83751474 | MN -95d | 9:2652 |
| **FOA-C-** | | | | |
| 40107-C3 | Foersvarets Forskingsanstalt, Umea, Sweden | | MN -48 | 9:3411 |
| **FRNC-TH-** | | | | |
| 1113 | NTIS (US Sales Only), PC A05/MF A01 | DE83703323 | MN -37 | 9:3174 |
| 1115 | NTIS (US Sales Only), PC A06/MF A01 | DE83704400 | MN -48 | 9:3357 |
| 1146 | NTIS (US Sales Only), PC A10/MF A01 | DE83704390 | MN -4 | 9:3039 |
| 1148 | NTIS (US Sales Only), PC A08/MF A01 | DE83704395 | MN -48 | 9:3393 |
| 1151 | NTIS (US Sales Only), PC A10/MF A01 | DE83704397 | MN -41 | 9:2283 |
| 1152 | NTIS (US Sales Only), PC A08/MF A01 | DE83704404 | MN -79 | 9:2284 |
| **GA-A-** | | | | |
| 16807 | NTIS, PC A06/MF A01 | DE84002560 | STD -77 | 9:2244 |
| 16982 | NTIS, PC A03/MF A01 | DE84002669 | MN -77 | 9:2245 |
| 17109 | NTIS, PC A06/MF A01; 1 | DE84002417 | MN -95 | 9:2653 |
| **GAO/GGD-** | | | | |
| 83-7 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -98E | 9:2533 |
| **GAO/ID-** | | | | |
| 83-44 | General Accounting Office, Gaithersburg, MD 20760 | | MN -90j | 9:2561 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| **GAO/PLRD-** | | | | |
| 83-70 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -13 | 9:2534 |
| **GAO/RCED-** | | | | |
| 83-41 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -13 | 9:2535 |
| 83-48 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -70B | 9:2057 |
| 83-51 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -13 | 9:2536 |
| 83-77 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -92 | 9:1861 |
| 83-102 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -98C | 9:1898 |
| 83-105 | General Accounting Office, Document Handling and Information Service Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -20 | 9:4159 |
| 83-106 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -92 | 9:2539 |
| 83-142 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -98C | 9:2559 |
| 83-147 | US General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20760 | | MN -98E | 9:2572 |
| 83-168 | US General Accounting Office, Document Handling and Information Services Facility, PO Box 6015, Gaithersburg, MD 20760 | | MN -11 | 9:3344 |
| **GEPP-TIS-** | | | | |
| 761 | NTIS, PC A03/MF A01 | DE84002960 | MN -13 | 9:2071 |
| **GSF-S-** | | | | |
| 885 | NTIS (US Sales Only), PC A04/MF A01 | DE83751351 | MN -48 | 9:3979 |
| **HEDL-SA-** | | | | |
| 2755-FP | NTIS, PC A02/MF A01; 1 | DE84001478 | MN -79m | 9:2383 |
| 2786 | NTIS, PC A02/MF A01 | DE83017005 | MN -79 | 9:2285 |
| 2829 | NTIS, PC A02/MF A01; 1 | DE84001481 | MN -79m | 9:2343 |
| 2835-FP | NTIS, PC A02/MF A01 | DE84001482 | MN -79h | 9:2413 |
| 2839 | NTIS, PC A03/MF A01; 1 | DE84001493 | MN -79h | 9:2414 |
| 2858-FP | NTIS, PC A02/MF A01 | DE84001483 | MN -78 | 9:2338 |
| 2860-FP | NTIS, PC A02/MF A01; 1 | DE84001476 | MN -78 | 9:2205 |
| 2874 | NTIS, PC A02/MF A01 | DE84001486 | MN -80 | 9:1933 |
| 2884a | NTIS, PC A02/MF A01 | DE84001488 | MN -78 | 9:2415 |
| 2909-FP | NTIS, PC A02/MF A01 | DE84001484 | MN -25 | 9:2688 |
| 2912-FP | NTIS, PC A02/MF A01 | DE84002115 | MN -20c | 9:2689 |
| 2913 | NTIS, PC A02/MF A01 | DE84001470 | MN -20c | 9:2690 |
| 2982 | NTIS, PC A03/MF A01 | DE84001467 | MN -25 | 9:2691 |
| 2984-FP | NTIS, PC A02/MF A01 | DE84001468 | MN -25 | 9:3094 |
| 2987 | NTIS, PC A02/MF A01 | DE84001464 | MN -20c | 9:4160 |
| **HEDL-TME-** | | | | |
| 83-28 | NTIS, PC A04/MF A01 | DE84002957 | STD -70 | 9:1928 |
| **HMI-B-** | | | | |
| 317 | NTIS (US Sales Only), PC A10/MF A01 | DE83751362 | MN -4 | 9:3031 |
| **HRP-** | | | | |
| 0905480/ 0 | NTIS, PC A02/MF A01 | | | 9:3358 |
| **HTC-** | | | | |
| 2M7-77 | Hughes Tool Co., Aircraft Div., Culver City, CA | | MN -92a | 9:3071 |
| **IA-** | | | | |
| 114/ 83 | *See* OEFZS-4203 | DE83703745 | MN -23 | 9:3195 |
| 1378 | NTIS (US Sales Only), PC A03/MF A01 | DE84700017 | MN -20 | 9:4161 |
| **IABG-B-TF-** | | | | |
| 1337 | NTIS (US Sales Only), PC A08/MF A01 | DE83751361 | MN -80 | 9:2416 |
| **IAE-** | | | | |
| 3468/ 6 | NTIS (US Sales Only), PC A04/MF A01 | DE83703986 | MN -34A | 9:3967 |
| 3525/ 8 | NTIS (US Sales Only), PC A02/MF A01 | DE83703991 | MN -20 | 9:4162 |
| 3545/ 7 | NTIS (US Sales Only), PC A03/MF A01 | DE84700018 | MN -20 | 9:4163 |
| 3561/ 4 | NTIS (US Sales Only), PC A03/MF A01 | DE83703765 | MN -80 | 9:2325 |
| 3575/ 11 | NTIS (US Sales Only), PC A03/MF A01 | DE83703987 | MN -34A | 9:2692 |
| 3588/ 16 | NTIS (US Sales Only), PC A02/MF A01 | DE83703992 | MN -20 | 9:4058 |
| 3600/ 6 | NTIS (US Sales Only), PC A02/MF A01 | DE84700019 | MN -20 | 9:4059 |
| 3611/ 12 | NTIS (US Sales Only), PC A02/MF A01 | DE84700003 | MN -34D | 9:4007 |
| **IAEA-SR-** | | | | |
| 72 | NTIS (US Sales Only), PC A99/MF A01 | DE84780010 | MN -80 | 9:1962 |
| 72/ 34 | *See* IAEA-SR-72 | DE84780010 | MN -80 | 9:1962 |
| **IAEA-TC-** | | | | |
| 389/ 6-13 | NTIS (US Sales Only), PC A02/MF A01 | DE83703788 | MN -37 | 9:2386 |
| 389/ 6-18 | NTIS (US Sales Only), PC A03/MF A01 | DE83703776 | MN -77 | 9:2246 |
| 389/ 6-19 | NTIS (US Sales Only), PC A02/MF A01 | DE83703789 | MN -37 | 9:2247 |
| 389/ 6-23 | NTIS (US Sales Only), PC A02/MF A01 | DE83703799 | MN -37 | 9:2248 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| **IC-** | | | | |
| 80/ 2 | NTIS (US Sales Only), PC A03/MF A01 | DE83704009 | MN -34D | 9:3745 |
| 80/ 6 | NTIS (US Sales Only), PC A02/MF A01 | DE83704015 | MN -34D | 9:3746 |
| 80/ 18 | NTIS (US Sales Only), PC A02/MF A01 | DE83704008 | MN -34D | 9:3796 |
| 80/ 26 | NTIS (US Sales Only), PC A03/MF A01 | DE83704010 | MN -34D | 9:3747 |
| 80/ 49 | NTIS (US Sales Only), PC A02/MF A01 | DE83704011 | MN -34D | 9:3748 |
| 80/ 50 | NTIS (US Sales Only), PC A03/MF A01 | DE83704012 | MN -34D | 9:3749 |
| 80/ 52 | NTIS (US Sales Only), PC A04/MF A01 | DE83704013 | MN -34D | 9:3750 |
| 80/ 54 | NTIS (US Sales Only), PC A03/MF A01 | DE83704014 | MN -34D | 9:3797 |
| 80/ 72 | NTIS (US Sales Only), PC A03/MF A01 | DE83704016 | MN -34D | 9:3798 |
| 80/ 86 | NTIS (US Sales Only), PC A02/MF A01 | DE83704017 | MN -34D | 9:3751 |
| 80/ 88 | NTIS (US Sales Only), PC A02/MF A01 | DE83704018 | MN -34D | 9:3752 |
| 80/ 94 | NTIS (US Sales Only), PC A02/MF A01 | DE83704019 | MN -34D | 9:3799 |
| 80/ 116 | NTIS (US Sales Only), PC A02/MF A01 | DE83704006 | MN -34D | 9:3800 |
| 80/ 118 | NTIS (US Sales Only), PC A02/MF A01 | DE83703972 | MN -34D | 9:4036 |
| 80/ 123 | NTIS (US Sales Only), PC A03/MF A01 | DE83703973 | MN -34D | 9:3828 |
| 80/ 125 | NTIS (US Sales Only), PC A02/MF A01 | DE83704007 | MN -34D | 9:3801 |
| 81/ 154 | NTIS (US Sales Only), PC A02/MF A01 | DE83704020 | MN -34D | 9:3802 |
| 82/ 15 | NTIS (US Sales Only), PC A03/MF A01 | DE83704027 | MN -34D | 9:3803 |
| 82/ 71 | NTIS (US Sales Only), PC A02/MF A01 | DE83704032 | MN -34D | 9:3753 |
| 82/ 89 | NTIS (US Sales Only), PC A03/MF A01 | DE83704033 | MN -34D | 9:3804 |
| 82/ 91 | NTIS (US Sales Only), PC A02/MF A01 | DE83704034 | MN -34D | 9:3754 |
| 82/ 92 | NTIS (US Sales Only), PC A02/MF A01 | DE83704035 | MN -34D | 9:3805 |
| 82/ 93 | NTIS (US Sales Only), PC A02/MF A01 | DE83703975 | MN -34D | 9:3829 |
| 82/ 108 | NTIS (US Sales Only), PC A02/MF A01 | DE83704021 | MN -34D | 9:3830 |
| 82/ 111 | NTIS (US Sales Only), PC A03/MF A01 | DE83704022 | MN -34D | 9:3806 |
| 82/ 117 | NTIS (US Sales Only), PC A02/MF A01 | DE83704023 | MN -34D | 9:3807 |
| 82/ 118 | NTIS (US Sales Only), PC A02/MF A01 | DE83704024 | MN -34D | 9:3808 |
| 82/ 132 | NTIS (US Sales Only), PC A02/MF A01 | DE83703993 | MN -20 | 9:4060 |
| 82/ 141 | NTIS (US Sales Only), PC A02/MF A01 | DE83704025 | MN -34D | 9:3809 |
| 82/ 145 | NTIS (US Sales Only), PC A02/MF A01 | DE83704026 | MN -34D | 9:3755 |
| 82/ 153 | NTIS (US Sales Only), PC A02/MF A01 | DE83704028 | MN -34D | 9:3831 |
| 82/ 157 | NTIS (US Sales Only), PC A02/MF A01 | DE83704029 | MN -34D | 9:3810 |
| 82/ 194 | NTIS (US Sales Only), PC A02/MF A01 | DE83703974 | MN -34D | 9:3832 |
| 82/ 222 | NTIS (US Sales Only), PC A03/MF A01 | DE83704030 | MN -34D | 9:3811 |
| 82/ 223 | NTIS (US Sales Only), PC A02/MF A01 | DE83704031 | MN -34D | 9:3756 |
| **IDO-** | | | | |
| 10109 | NTIS MF A01; 2 | DE83001143 | STD -97e | 9:2192 |
| **IFT-P-** | | | | |
| 06/ 81 | NTIS (US Sales Only), PC A06/MF A01 | DE83704377 | MN -34D | 9:3833 |
| **IFUSP-P-** | | | | |
| 301 | NTIS (US Sales Only), PC A02/MF A01 | DE83704283 | MN -34C | 9:3945 |
| 302 | NTIS (US Sales Only), PC A02/MF A01 | DE83704284 | MN -34C | 9:3946 |
| 304 | NTIS (US Sales Only), PC A02/MF A01 | DE83704285 | MN -34C | 9:3947 |
| 310 | NTIS (US Sales Only), PC A02/MF A01 | DE83704280 | MN -34D | 9:3628 |
| 313 | NTIS (US Sales Only), PC A02/MF A01 | DE83704282 | MN -46 | 9:3948 |
| **IFVE-OEIPK-** | | | | |
| 82-153 | NTIS (US Sales Only), PC A02/MF A01 | DE84700054 | MN -34D | 9:3629 |
| **IFVE-OTF-** | | | | |
| 82-22 | NTIS (US Sales Only), PC A02/MF A01 | DE83704038 | MN -34D | 9:3757 |
| 82-37 | NTIS (US Sales Only), PC A02/MF A01 | DE83704039 | MN -34D | 9:3812 |
| 82-38 | NTIS (US Sales Only), PC A02/MF A01 | DE83704040 | MN -34D | 9:3758 |
| 82-56 | NTIS (US Sales Only), PC A02/MF A01 | DE83703980 | MN -34D | 9:4008 |
| 82-106 | NTIS (US Sales Only), PC A02/MF A01 | DE83703976 | MN -34D | 9:3759 |
| 82-112 | NTIS (US Sales Only), PC A02/MF A01 | DE83704036 | MN -34D | 9:3760 |
| 82-113 | NTIS (US Sales Only), PC A02/MF A01 | DE83703977 | MN -34D | 9:4037 |
| 82-162 | NTIS (US Sales Only), PC A02/MF A01 | DE83703978 | MN -34D | 9:4009 |
| 82-169 | NTIS (US Sales Only), PC A02/MF A01 | DE83703979 | MN -34D | 9:3834 |
| 82-190 | NTIS (US Sales Only), PC A02/MF A01 | DE83704037 | MN -34D | 9:3813 |
| **IKE-** | | | | |
| 8-1 | NTIS (US Sales Only), PC A07/MF A01 | DE84750244 | MN -98 | 9:2540 |
| **ILE-** | | | | |
| 8202P | NTIS (US Sales Only), PC A02/MF A01 | DE84700020 | MN -20 | 9:4061 |
| **INDC(GDR)-** | | | | |
| 18/ L | NTIS (US Sales Only), PC A03/MF A01 | DE83703790 | MN -37 | 9:3176 |
| **INDC(JAP)-** | | | | |
| 78/ L | *See* NEANDC-J-91/U | DE84900011 | MN -34C | 9:3915 |
| **INIS-BR-** | | | | |
| 79 | NTIS (US Sales Only), PC A11/MF A01 | DE83704381 | MN -34A | 9:3984 |
| 80 | NTIS (US Sales Only), PC A02/MF A01 | DE83704405 | MN -37 | 9:3178 |
| 81 | NTIS (US Sales Only), PC A03/MF A01 | DE83704386 | MN -34D | 9:3761 |
| 82 | NTIS (US Sales Only), PC A02/MF A01 | DE83704378 | MN -34D | 9:4011 |
| 83 | NTIS (US Sales Only), PC A02/MF A01 | DE83704379 | MN -34D | 9:4012 |
| 84 | NTIS (US Sales Only), PC A03/MF A01 | DE83704380 | MN -34D | 9:3835 |
| 85 | NTIS (US Sales Only), PC A04/MF A01 | DE83704387 | MN -34D | 9:3762 |
| **INIS-mf-** | | | | |
| 8050 | NTIS (US Sales Only), PC A02/MF A01 | DE83703607 | MN -23 | 9:3389 |
| 8189 | NTIS (US Sales Only), PC A06/MF A01 | DE83703328 | MN -2 | 9:2316 |
| 8190 | NTIS (US Sales Only), PC A04/MF A01 | DE83703329 | MN -2 | 9:2551 |
| 8257 | NTIS (US Sales Only), PC A05/MF A01 | DE83704388 | MN -34C | 9:3927 |
| 8260 | NTIS (US Sales Only), PC A07/MF A01 | DE83704384 | MN -34A | 9:2705 |
| 8262 | NTIS (US Sales Only), PC A08/MF A01 | DE83704401 | MN -48 | 9:3359 |
| 8263 | NTIS (US Sales Only), PC A09/MF A01 | DE83704382 | MN -34A | 9:3040 |
| 8264 | NTIS (US Sales Only), PC A06/MF A01 | DE83704394 | MN -51 | 9:3041 |
| 8265 | NTIS (US Sales Only), PC A06/MF A01 | DE83704389 | MN -34C | 9:3866 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 8266 | NTIS (US Sales Only), PC A05/MF A01 | DE83704391 | MN -4 | 9:3042 |
| 8268 | NTIS (US Sales Only), PC A03/MF A01 | DE83704403 | MN -78 | 9:2417 |
| 8269 | NTIS (US Sales Only), PC A11/MF A01 | DE83704396 | MN -23 | 9:3360 |
| 8270 | NTIS (US Sales Only), PC A05/MF A01 | DE83704402 | MN -48 | 9:3361 |
| 8271 | NTIS (US Sales Only), PC A14/MF A01 | DE83704385 | MN -34A | 9:3534 |
| 8272 | NTIS (US Sales Only), PC A03/MF A01 | DE83704383 | MN -34A | 9:2706 |
| 8273 | NTIS (US Sales Only), PC A08/MF A01 | DE83704392 | MN -4 | 9:3032 |
| 8274 | NTIS (US Sales Only), PC A04/MF A01 | DE83704393 | MN -25 | 9:2707 |
| 8283 | NTIS (US Sales Only), PC A13/MF A01 | DE83704398 | MN -41 | 9:2344 |
| 8403 | NTIS (US Sales Only), PC A03/MF A01 | DE83703321 | MN -77 | 9:2249 |
| 8407 | NTIS (US Sales Only), PC A02/MF A01 | DE83703331 | MN -2 | 9:2303 |
| 8408 | NTIS (US Sales Only), PC A02/MF A01 | DE83703312 | MN -78 | 9:2418 |
| 8409 | NTIS (US Sales Only), PC A03/MF A01 | DE83703313 | MN -78 | 9:2226 |
| 8411 | NTIS (US Sales Only), PC A02/MF A01 | DE83703310 | MN -78 | 9:2419 |
| 8413 | NTIS (US Sales Only), PC A03/MF A01 | DE83703314 | MN -78 | 9:2420 |
| 8414 | NTIS (US Sales Only), PC A03/MF A01 | DE83703315 | MN -78 | 9:2421 |
| 8416 | NTIS (US Sales Only), PC A03/MF A01 | DE83703311 | MN -78 | 9:2210 |
| 8417 | NTIS (US Sales Only), PC A02/MF A01 | DE83703316 | MN -78 | 9:2422 |
| 8420 | NTIS (US Sales Only), PC A04/MF A01 | DE83703317 | MN -78 | 9:2227 |
| 8421 | NTIS (US Sales Only), PC A05/MF A01 | DE83703318 | MN -78 | 9:2228 |
| 8431 | NTIS (US Sales Only), PC A02/MF A01 | DE83703330 | MN -2 | 9:2317 |
| 8439 | NTIS (US Sales Only), PC A05/MF A01 | DE83703319 | MN -78 | 9:2229 |
| 8446 | NTIS (US Sales Only), PC A03/MF A01 | DE83703332 | MN -2 | 9:2305 |
| 8447 | NTIS (US Sales Only), PC A03/MF A01 | DE83703309 | MN -80 | 9:2345 |
| 8454 | NTIS (US Sales Only), PC A02/MF A01 | DE83703333 | MN -2 | 9:2306 |
| 8458 | NTIS (US Sales Only), PC A02/MF A01 | DE83703327 | MN -70 | 9:1963 |
| 8460 | NTIS (US Sales Only), PC A02/MF A01 | DE83703334 | MN -2 | 9:1964 |
| 8461 | NTIS (US Sales Only), PC A04/MF A01 | DE83703324 | MN -70 | 9:2318 |
| 8462 | NTIS (US Sales Only), PC A03/MF A01 | DE83703335 | MN -70 | 9:1965 |
| 8463 | NTIS (US Sales Only), PC A02/MF A01 | DE83703325 | MN -70 | 9:1966 |
| 8464 | NTIS (US Sales Only), PC A03/MF A01 | DE83703320 | MN -78 | 9:2230 |
| 8466 | NTIS (US Sales Only), PC A04/MF A01 | DE83703322 | MN -80 | 9:2211 |
| 8470 | NTIS (US Sales Only), PC A03/MF A01 | DE83703326 | MN -70 | 9:1967 |
| 8506 | NTIS (US Sales Only), PC A03/MF A01 | DE83703592 | MN -78 | 9:2434 |
| 8530 | NTIS (US Sales Only), PC A04/MF A01 | DE83703598 | MN -78 | 9:2435 |
| 8531 | NTIS (US Sales Only), PC A07/MF A01 | DE83703595 | MN -38 | 9:3088 |
| 8535 | NTIS (US Sales Only), PC A02/MF A01 | DE83703601 | MN -70 | 9:1983 |
| 8543 | NTIS (US Sales Only), PC A04/MF A01 | DE83703596 | MN -80 | 9:2436 |
| 8544 | NTIS (US Sales Only), PC A03/MF A01 | DE83703603 | MN -70 | 9:1984 |
| 8547 | NTIS (US Sales Only), PC A05/MF A01 | DE83703606 | MN -71 | 9:1929 |
| 8548 | NTIS (US Sales Only), PC A05/MF A01 | DE83703594 | MN -48 | 9:3380 |
| 8550 | NTIS (US Sales Only), PC A03/MF A01 | DE83703604 | MN -70 | 9:1942 |
| 8551 | NTIS (US Sales Only), PC A02/MF A01 | DE83703599 | MN -70A | 9:2388 |
| 8552 | NTIS (US Sales Only), PC A04/MF A01 | DE83703605 | MN -70 | 9:1985 |
| 8553 | NTIS (US Sales Only), PC A02/MF A01 | DE83703602 | MN -70 | 9:1986 |
| 8554 | NTIS (US Sales Only), PC A02/MF A01 | DE83703600 | MN -70 | 9:1987 |
| 8555 | NTIS (US Sales Only), PC A05/MF A01 | DE83703593 | MN -80 | 9:2328 |
| 8565 | NTIS (US Sales Only), PC A03/MF A01 | DE83703831 | MN -2 | 9:3535 |
| 8567 | NTIS (US Sales Only), PC A03/MF A01 | DE83703832 | MN -2 | 9:3857 |
| 8568 | NTIS (US Sales Only), PC A03/MF A01 | DE83703833 | MN -2 | 9:3858 |
| 8569 | NTIS (US Sales Only), PC A02/MF A01 | DE83703834 | MN -2 | 9:3859 |
| 8570 | NTIS (US Sales Only), PC A02/MF A01 | DE83703835 | MN -2 | 9:3860 |
| 8571 | NTIS (US Sales Only), PC A02/MF A01 | DE83703836 | MN -2 | 9:3861 |
| 8577 | NTIS (US Sales Only), PC A03/MF A01 | DE83703994 | MN -20 | 9:4062 |
| 8602 | NTIS (US Sales Only), PC A02/MF A01 | DE83704399 | MN -41 | 9:2437 |
| 8604 | NTIS (US Sales Only), PC A02/MF A01 | DE83704415 | MN -2 | 9:4265 |
| 8605 | NTIS (US Sales Only), PC A04/MF A01 | DE83704407 | MN -2 | 9:1915 |
| 8606 | NTIS (US Sales Only), PC A02/MF A01 | DE83704408 | MN -2 | 9:1916 |
| 8607 | NTIS (US Sales Only), PC A03/MF A01 | DE83704416 | MN -2 | 9:4266 |
| 8608 | NTIS (US Sales Only), PC A03/MF A01 | DE83704417 | MN -2 | 9:2050 |
| 8609 | NTIS (US Sales Only), PC A02/MF A01 | DE83704424 | MN -2 | 9:1943 |
| 8610 | NTIS (US Sales Only), PC A03/MF A01 | DE83704418 | MN -2 | 9:4267 |
| 8611 | NTIS (US Sales Only), PC A06/MF A01 | DE83704409 | MN -2 | 9:1917 |
| 8612 | NTIS (US Sales Only), PC A02/MF A01 | DE83704419 | MN -2 | 9:4268 |
| 8613 | NTIS (US Sales Only), PC A02/MF A01 | DE83704410 | MN -2 | 9:2058 |
| 8614 | NTIS (US Sales Only), PC A03/MF A01 | DE83704420 | MN -2 | 9:4269 |
| 8615 | NTIS (US Sales Only), PC A02/MF A01 | DE83704427 | MN -2 | 9:4270 |
| 8616 | NTIS (US Sales Only), PC A02/MF A01 | DE83704425 | MN -2 | 9:1988 |
| 8617 | NTIS (US Sales Only), PC A02/MF A01 | DE83704413 | MN -2 | 9:1989 |
| 8618 | NTIS (US Sales Only), PC A02/MF A01 | DE83704428 | MN -2 | 9:2059 |
| 8620 | NTIS (US Sales Only), PC A02/MF A01 | DE83704426 | MN -2 | 9:1990 |
| 8621 | NTIS (US Sales Only), PC A03/MF A01 | DE83704421 | MN -2 | 9:4271 |
| 8623 | NTIS (US Sales Only), PC A02/MF A01 | DE83704411 | MN -2 | 9:2060 |
| 8624 | NTIS (US Sales Only), PC A02/MF A01 | DE83704422 | MN -2 | 9:4272 |
| 8625 | NTIS (US Sales Only), PC A02/MF A01 | DE83704423 | MN -2 | 9:4273 |
| 8626 | NTIS (US Sales Only), PC A02/MF A01 | DE83704412 | MN -2 | 9:1919 |
| 8627 | NTIS (US Sales Only), PC A02/MF A01 | DE83704406 | MN -2 | 9:2552 |
| 8628 | NTIS (US Sales Only), PC A02/MF A01 | DE83704414 | MN -2 | 9:1991 |
| 8629 | NTIS (US Sales Only), PC A02/MF A01 | DE83704429 | MN -2 | 9:4274 |
| **INPE-** | | | | |
| 2737-PRE/ 317 | *See* N-8327948 | | | 9:3473 |
| **INS-M-** | | | | |
| 59 | NTIS (US Sales Only), PC A02/MF A01 | DE83704310 | MN -51 | 9:3434 |
| **INS-R-** | | | | |
| 292 | NTIS (US Sales Only), PC A02/MF A01 | DE83704293 | MN -4 | 9:2894 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| 295 | NTIS (US Sales Only), PC A02/MF A01 | DE83704311 | MN -51 | 9:2157 |
| 298 | NTIS (US Sales Only), PC A04/MF A01 | DE83704319 | MN -48 | 9:2158 |
| 301 | NTIS (US Sales Only), PC A02/MF A01 | DE83704312 | MN -51 | 9:2165 |
| 302 | NTIS (US Sales Only), PC A02/MF A01 | DE83704313 | MN -51 | 9:2166 |
| 309 | NTIS (US Sales Only), PC A02/MF A01 | DE83704314 | MN -51 | 9:3435 |
| **IPNO-DRE-** | | | | |
| 83-02 | NTIS (US Sales Only), PC A02/MF A01 | DE84700076 | MN -34C | 9:3899 |
| 83-07 | NTIS (US Sales Only), PC A02/MF A01 | DE84700077 | MN -34C | 9:3906 |
| **IPNO-TH-** | | | | |
| 82-27 | NTIS (US Sales Only), PC A02/MF A01 | DE83704041 | MN -34D | 9:3768 |
| 82-46 | NTIS (US Sales Only), PC A02/MF A01 | DE83704281 | MN -34D | 9:3632 |
| 83-01 | NTIS (US Sales Only), PC A03/MF A01 | DE84700004 | MN -34D | 9:3950 |
| 83-02 | NTIS (US Sales Only), PC A03/MF A01 | DE84700040 | MN -34D | 9:3769 |
| 83-04 | NTIS (US Sales Only), PC A03/MF A01 | DE84700065 | MN -34C | 9:3951 |
| **IPPJ-** | | | | |
| 552 | NTIS (US Sales Only), PC A02/MF A01 | DE84700021 | MN -20 | 9:4063 |
| 553 | NTIS (US Sales Only), PC A02/MF A01 | DE84700022 | MN -20 | 9:4170 |
| 554 | NTIS (US Sales Only), PC A02/MF A01 | DE84700023 | MN -20 | 9:4064 |
| 555 | NTIS (US Sales Only), PC A02/MF A01 | DE84700024 | MN -20 | 9:4065 |
| 556 | NTIS (US Sales Only), PC A02/MF A01 | DE84700025 | MN -20 | 9:4066 |
| 557 | NTIS (US Sales Only), PC A02/MF A01 | DE84700026 | MN -20 | 9:4067 |
| 558 | NTIS (US Sales Only), PC A03/MF A01 | DE84700027 | MN -20 | 9:4068 |
| 559 | NTIS (US Sales Only), PC A02/MF A01 | DE84700028 | MN -20 | 9:4069 |
| 567 | NTIS (US Sales Only), PC A02/MF A01 | DE84700029 | MN -20 | 9:4070 |
| 575 | NTIS (US Sales Only), PC A03/MF A01 | DE84700030 | MN -20 | 9:4071 |
| 576 | NTIS (US Sales Only), PC A02/MF A01 | DE84700031 | MN -20 | 9:4072 |
| 580 | NTIS (US Sales Only), PC A03/MF A01 | DE84700032 | MN -20 | 9:4073 |
| 583 | NTIS (US Sales Only), PC A02/MF A01 | DE84700033 | MN -20 | 9:4074 |
| **IS-** | | | | |
| 4815 | NTIS, PC A06/MF A01; 1 | DE84002634 | MN -2 | 9:4017 |
| 4820-Vol.1-2 | NTIS, PC A15/MF A01 | DE84002630 | MN -13 | 9:2096 |
| 4838 | NTIS, PC A10/MF A01 | DE84001906 | MN -25 | 9:3097 |
| **ISN-** | | | | |
| 82-50 | NTIS (US Sales Only), PC A02/MF A01 | DE83704289 | MN -34C | 9:3867 |
| **ITEF-** | | | | |
| 103(1982) | NTIS (US Sales Only), PC A02/MF A01 | DE84700055 | MN -34D | 9:3633 |
| 166(1982) | NTIS (US Sales Only), PC A03/MF A01 | DE84700005 | MN -34D | 9:3838 |
| **ITEP-** | | | | |
| 80(1982) | NTIS (US Sales Only), PC A02/MF A01 | DE83704003 | MN -34B | 9:3450 |
| 96(1982) | NTIS (US Sales Only), PC A02/MF A01 | DE84700041 | MN -34D | 9:3839 |
| 102(1982) | NTIS (US Sales Only), PC A02/MF A01 | DE83703981 | MN -34D | 9:4018 |
| **ITF-** | | | | |
| 82-69-R | NTIS (US Sales Only), PC A04/MF A01 | DE83703995 | MN -20 | 9:4075 |
| **IVA-** | | | | |
| 236 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83751426 | MN -90 | 9:2097 |
| **IVL-B-** | | | | |
| 713 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751418 | MN -11 | 9:3267 |
| **JAERI-** | | | | |
| 1279 | NTIS (US Sales Only), PC A04/MF A01 | DE83703820 | MN -32 | 9:2250 |
| 1287 | *See* NEANDC-J-91/U | DE84900011 | MN -34C | 9:3915 |
| **JAERI-M-** | | | | |
| 82-005 | NTIS (US Sales Only), PC A02/MF A01 | DE83703772 | MN -78 | 9:2339 |
| 82-012 | NTIS (US Sales Only), PC A07/MF A01 | DE83703783 | MN -80 | 9:2389 |
| 82-016 | NTIS (US Sales Only), PC A13/MF A01 | DE83703784 | MN -80 | 9:2390 |
| 82-043 | NTIS (US Sales Only), PC A03/MF A01 | DE83703777 | MN -77 | 9:2251 |
| 82-055 | NTIS (US Sales Only), PC A04/MF A01 | DE83703758 | MN -25 | 9:2708 |
| 82-068 | NTIS (US Sales Only), PC A02/MF A01 | DE83703759 | MN -25 | 9:3098 |
| 82-072 | NTIS (US Sales Only), PC A06/MF A01 | DE83703821 | MN -32 | 9:2329 |
| 82-075 | NTIS (US Sales Only), PC A03/MF A01 | DE83703773 | MN -78 | 9:2438 |
| 82-076 | NTIS (US Sales Only), PC A03/MF A01 | DE83703774 | MN -78 | 9:2439 |
| 82-082 | NTIS (US Sales Only), PC A03/MF A01 | DE83703760 | MN -25 | 9:3099 |
| 82-086 | NTIS (US Sales Only), PC A03/MF A01 | DE83703750 | MN -28 | 9:3149 |
| 82-088 | NTIS (US Sales Only), PC A02/MF A01 | DE83703809 | MN -70 | 9:1992 |
| 82-091 | NTIS (US Sales Only), PC A04/MF A01 | DE83703822 | MN -32 | 9:3182 |
| 82-099 | NTIS (US Sales Only), PC A03/MF A01 | DE83703823 | MN -32 | 9:2440 |
| 82-118 | NTIS (US Sales Only), PC A05/MF A01 | DE84700010 | MN -34A | 9:3968 |
| 82-128 | NTIS (US Sales Only), PC A04/MF A01 | DE84700078 | MN -34C | 9:3952 |
| 82-130 | NTIS (US Sales Only), PC A03/MF A01 | DE84700062 | MN -46 | 9:3969 |
| 82-146 | NTIS (US Sales Only), PC A03/MF A01 | DE84700011 | MN -34A | 9:2828 |
| **JINR-** | | | | |
| 9-82-709 | NTIS (US Sales Only), PC A02/MF A01 | DE83703751 | MN -28 | 9:3138 |
| 9-82-756 | NTIS (US Sales Only), PC A02/MF A01 | DE83703752 | MN -28 | 9:3126 |
| 9-82-757 | NTIS (US Sales Only), PC A02/MF A01 | DE83703753 | MN -28 | 9:3150 |
| 11-82-739 | NTIS (US Sales Only), PC A02/MF A01 | DE83703824 | MN -32 | 9:3536 |
| 13-82-713 | NTIS (US Sales Only), PC A02/MF A01 | DE83703800 | MN -37 | 9:3210 |
| 13-82-728 | NTIS (US Sales Only), PC A02/MF A01 | DE83703791 | MN -37 | 9:3183 |
| 13-82-743 | NTIS (US Sales Only), PC A02/MF A01 | DE83703792 | MN -37 | 9:3184 |
| 13-82-762 | NTIS (US Sales Only), PC A02/MF A01 | DE83703801 | MN -37 | 9:3185 |
| 13-82-768 | NTIS (US Sales Only), PC A02/MF A01 | DE83703793 | MN -37 | 9:3186 |
| 13-82-769 | NTIS (US Sales Only), PC A02/MF A01 | DE83703794 | MN -37 | 9:3187 |
| D-1-82-895 | NTIS (US Sales Only), PC A02/MF A01 | DE84700056 | MN -34D | 9:3634 |
| E-1-82-719 | NTIS (US Sales Only), PC A02/MF A01 | DE83704290 | MN -34C | 9:3907 |
| E-1-82-847 | NTIS (US Sales Only), PC A02/MF A01 | DE84700057 | MN -34D | 9:3635 |
| E-2-82-409 | NTIS (US Sales Only), PC A02/MF A01 | DE84700066 | MN -34C | 9:3868 |
| E-2-82-771 | NTIS (US Sales Only), PC A02/MF A01 | DE83703982 | MN -34D | 9:4038 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| E-4-82-512 | NTIS (US Sales Only), PC A02/MF A01 | DE84700067 | MN -34C | 9:3900 |
| E-4-82-693 | NTIS (US Sales Only), PC A02/MF A01 | DE83704286 | MN -34C | 9:3953 |
| E-4-82-694 | NTIS (US Sales Only), PC A02/MF A01 | DE83704287 | MN -34C | 9:3936 |
| E-17-82-240 | NTIS (US Sales Only), PC A02/MF A01 | DE83704004 | MN -34A | 9:4000 |
| R-1-82-334 | NTIS (US Sales Only), PC A02/MF A01 | DE84700058 | MN -34D | 9:3636 |
| R-1-82-559 | NTIS (US Sales Only), PC A02/MF A01 | DE84700059 | MN -34D | 9:3637 |
| R-1-82-887 | NTIS (US Sales Only), PC A02/MF A01 | DE84700060 | MN -34D | 9:3638 |
| R-2-82-562 | NTIS (US Sales Only), PC A02/MF A01 | DE84700042 | MN -34D | 9:3770 |
| R-2-82-563 | NTIS (US Sales Only), PC A02/MF A01 | DE84700043 | MN -34D | 9:3771 |
| R-2-82-832 | NTIS (US Sales Only), PC A02/MF A01 | DE84700044 | MN -34D | 9:3772 |
| R-4-82-531 | NTIS (US Sales Only), PC A02/MF A01 | DE84700068 | MN -34C | 9:3923 |
| R-4-82-564 | NTIS (US Sales Only), PC A02/MF A01 | DE84700045 | MN -34D | 9:3773 |
| R-4-82-633 | NTIS (US Sales Only), PC A02/MF A01 | DE83703990 | MN -34A | 9:3639 |
| R-7-82-638 | NTIS (US Sales Only), PC A02/MF A01 | DE83704291 | MN -34C | 9:3937 |
| R-9-82-640 | NTIS (US Sales Only), PC A02/MF A01 | DE83703754 | MN -28 | 9:3139 |
| R-9-82-675 | NTIS (US Sales Only), PC A02/MF A01 | DE83703755 | MN -28 | 9:3140 |
| R-9-82-676 | NTIS (US Sales Only), PC A02/MF A01 | DE83703756 | MN -28 | 9:3141 |
| R-9-82-724 | NTIS (US Sales Only), PC A02/MF A01 | DE83703797 | MN -37 | 9:3188 |
| R-10-82-690 | NTIS (US Sales Only), PC A02/MF A01 | DE83703795 | MN -37 | 9:3189 |
| R-11-82-670 | NTIS (US Sales Only), PC A02/MF A01 | DE83703825 | MN -32 | 9:4019 |
| R-13-82-737 | NTIS (US Sales Only), PC A02/MF A01 | DE83703802 | MN -37 | 9:3190 |
| R-13-82-812 | NTIS (US Sales Only), PC A02/MF A01 | DE83703796 | MN -37 | 9:3191 |
| R-14-82-212 | NTIS (US Sales Only), PC A02/MF A01 | DE83704300 | MN -4 | 9:3537 |
| R-14-82-605 | NTIS (US Sales Only), PC A02/MF A01 | DE83703988 | MN -34A | 9:3538 |
| R-17-82-868 | NTIS (US Sales Only), PC A02/MF A01 | DE83703989 | MN -34A | 9:2829 |
| **Juel-** | | | | |
| 1821 | NTIS (US Sales Only), PC A10/MF A01 | DE83751357 | MN -41 | 9:3302 |
| 1833 | NTIS (US Sales Only), PC A08/MF A01 | DE83751356 | MN -80 | 9:2441 |
| 1835 | NTIS (US Sales Only), PC A04/MF A01 | DE83751359 | MN -80 | 9:1930 |
| 1837 | NTIS (US Sales Only), PC A07/MF A01 | DE83751360 | MN -38 | 9:3192 |
| 1841 | NTIS (US Sales Only), PC A06/MF A01 | DE83751358 | MN -77 | 9:2252 |
| **K/PS-** | | | | |
| 5013-EA | NTIS, PC A02/MF A01 | DE84002117 | MN -4 | 9:2895 |
| 5027 | NTIS, PC A02/MF A01 | DE84002430 | MN -11 | 9:3279 |
| **KAERI/RR-** | | | | |
| 381/ 82 | NTIS (US Sales Only), PC A06/MF A01 | DE84700034 | MN -20 | 9:4182 |
| **KAPL-** | | | | |
| 4154 | NTIS, PC A05/MF A01 | DE84002479 | MN -78 | 9:2286 |
| 4156 | NTIS, PC A08/MF A01 | DE84000537 | MN -78 | 9:2442 |
| 4157 | NTIS, PC A05/MF A01 | DE84000817 | MN -78 | 9:2443 |
| 4158 | NTIS, PC A06/MF A01; 1 | DE84000818 | MN -78 | 9:2287 |
| **KFTI-** | | | | |
| 82-32 | NTIS (US Sales Only), PC A02/MF A01 | DE83704303 | MN -25 | 9:2709 |
| 82-48 | NTIS (US Sales Only), PC A03/MF A01 | DE84700035 | MN -20 | 9:4076 |
| **KHM-TR-** | | | | |
| 71 | NTIS (US Sales Only), PC A03/MF A01 | DE83751427 | MN -41 | 9:3412 |
| 78 | NTIS (US Sales Only), PC A04/MF A01 | DE83751428 | MN -41 | 9:3413 |
| 83 | NTIS (US Sales Only), PC A03/MF A01 | DE83751429 | MN -41 | 9:3414 |
| 85 | NTIS (US Sales Only), PC A06/MF A01; 1 | DE83751430 | MN -90i | 9:3415 |
| 87 | NTIS (US Sales Only), PC A04/MF A01 | DE83751431 | MN -41 | 9:3416 |
| **KTM/E-B-** | | | | |
| 22 | NTIS (US Sales Only), PC A06/MF A01; | DE83751447 | MN -90 | 9:2112 |
| 23 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751448 | MN -90 | 9:2113 |
| 24 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751449 | MN -90 | 9:2562 |
| **KTM/E-D-** | | | | |
| 12 | NTIS (US Sales Only), PC A11/MF A01; 1 | DE83751445 | MN -41 | 9:3268 |
| 22 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83751450 | MN -95d | 9:2618 |
| 23 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751446 | MN -98 | 9:2577 |
| 24 | NTIS (US Sales Only), PC A05/MF A01; 1 | DE83751444 | MN -95e | 9:2114 |
| **KURRI-TR-** | | | | |
| 216 | NTIS (US Sales Only), PC A04/MF A01 | DE83703785 | MN -80 | 9:2391 |
| 220 | NTIS (US Sales Only), PC A04/MF A01 | DE83703827 | MN -2 | 9:2392 |
| **LA-** | | | | |
| 9587-MS | NTIS, PC A04/MF A01 | DE84002320 | STD -34C | 9:3774 |
| 9651-MS | NTIS, PC A06/MF A01 | DE84002404 | STD -34 | 9:3228 |
| 9737-MS | NTIS, PC A14/MF A01; 1 | DE84002268 | STD -20d | 9:4184 |
| 9748-MS | NTIS, PC A04/MF A01 | DE84002402 | STD -34 | 9:3257 |
| 9798-P | NTIS, PC A19/MF A01 | DE83016338 | STD -28 | 9:3640 |
| 9848-MS | NTIS, PC A03/MF A01 | DE84002299 | STD -20g | 9:4077 |
| 9849-MS | NTIS, PC A02/MF A01 | DE84002322 | STD -28 | 9:3104 |
| 9856-MS | NTIS, PC A02/MF A01 | DE84002308 | STD -34 | 9:4020 |
| 9871-MS | NTIS, PC A02/MF A01 | DE84002321 | STD -32 | 9:3123 |
| 9875-MS | NTIS, PC A03/MF A01 | DE84002310 | STD -32 | 9:4242 |
| **LA-tr-** | | | | |
| 83-21 | NTIS, PC A04/MF A01 | DE84002816 | MN -20a | 9:4231 |
| **LA-UR-** | | | | |
| 83-2586 | NTIS, PC A02/MF A01 | DE84001355 | MN -34B | 9:3452 |
| 83-2681 | NTIS, PC A02/MF A01 | DE84001320 | MN -34B | 9:3453 |
| 83-2761 | NTIS, PC A02/MF A01; 1 | DE84001313 | MN -4 | 9:2115 |
| 83-2763 | NTIS, PC A02/MF A01 | DE84001314 | MN -34C | 9:3872 |
| 83-2776 | NTIS, PC A02/MF A01 | DE84001301 | MN -34B | 9:3454 |
| 83-2777 | NTIS, PC A02/MF A01; 1 | DE84001302 | MN -34B | 9:3455 |
| 83-2847 | NTIS, PC A04/MF A01; 1 | DE84001172 | MN -45 | 9:3229 |
| 83-2887 | NTIS, PC A02/MF A01; 1 | DE84001661 | MN -34B | 9:3456 |
| 83-2896 | NTIS, PC A02/MF A01 | DE84001867 | MN -34B | 9:3457 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| 83-2901 | NTIS, PC A02/MF A01 | DE84001870 | MN -34B | 9:3458 |
| 83-2927 | NTIS, PC A02/MF A01 | DE84001908 | MN -34C | 9:3914 |
| 83-2979 | NTIS MF A01; 2 | DE84001706 | MN -32 | 9:4260 |
| 83-2980 | NTIS MF A01; 2 | DE84001707 | MN -32 | 9:4261 |
| 83-2982 | NTIS, PC A02/MF A01 | DE84001708 | MN -25 | 9:2711 |
| 83-2997 | NTIS, PC A03/MF A01 | DE84001709 | MN -34B | 9:3504 |
| 83-3012 | NTIS, PC A02/MF A01 | DE84001705 | MN -34A | 9:3194 |
| 83-3014 | NTIS, PC A02/MF A01 | DE84001704 | MN -34A | 9:3541 |
| 83-3067 | NTIS, PC A02/MF A01 | DE84001726 | MN -34D | 9:3776 |
| 83-3071 | NTIS, PC A02/MF A01 | DE84001728 | MN -66d | 9:2174 |
| 83-3072 | NTIS, PC A02/MF A01 | DE84001727 | MN -66d | 9:2175 |
| 83-3095 | NTIS, PC A02/MF A01; 1 | DE84001721 | MN -34C | 9:3542 |
| 83-3096 | NTIS, PC A02/MF A01 | DE84001748 | MN -34D | 9:3712 |
| 83-3110 | NTIS, PC A02/MF A01 | DE84001747 | MN -48 | 9:3417 |
| **LBL-** | | | | |
| 11531 | NTIS, PC A09/MF A01; 1 | DE84002888 | MN -11 | 9:2573 |
| 16259 | NTIS, PC A13/MF A01; 1 | DE84003040 | MN -11 | 9:3442 |
| 16523 | NTIS, PC A02/MF A01 | DE84000167 | MN -94c | 9:2526 |
| 16569 | NTIS, PC A03/MF A01 | DE84001044 | MN -4 | 9:2915 |
| 16694 | NTIS, PC A05/MF A01; 1 | DE84003046 | MN -37 | 9:3211 |
| **LRAP-** | | | | |
| 16 | NTIS (US Sales Only), PC A02/MF A01; 1 | DE83751414 | MN -4 | 9:3055 |
| 20 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751415 | MN -4 | 9:3056 |
| **LUTMDN/TMVK-** | | | | |
| 3118/ 1-32/ (1983) | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751422 | MN -96 | 9:2549 |
| **MHD-III-** | | | | |
| 82-048 | NTIS, PC A05/MF A01; 1 | DE83018285 | STD -90g | 9:2588 |
| 83-070 | NTIS, PC A03/MF A01 | DE84001523 | MN -90g | 9:2589 |
| **MINTEK-M-** | | | | |
| 48 | NTIS (US Sales Only), PC A04/MF A01 | DE83704294 | MN -4 | 9:3116 |
| 55 | NTIS (US Sales Only), PC A02/MF A01 | DE83703815 | MN -2 | 9:3212 |
| 61 | NTIS (US Sales Only), PC A02/MF A01 | DE83703826 | MN -32 | 9:3213 |
| 69 | NTIS (US Sales Only), PC A03/MF A01 | DE83704295 | MN -4 | 9:2897 |
| 79 | NTIS (US Sales Only), PC A02/MF A01 | DE83704296 | MN -4 | 9:2898 |
| 80 | NTIS (US Sales Only), PC A02/MF A01 | DE83704297 | MN -4 | 9:3214 |
| 81 | NTIS (US Sales Only), PC A02/MF A01 | DE83704298 | MN -4 | 9:2899 |
| 84 | NTIS (US Sales Only), PC A02/MF A01 | DE83704299 | MN -4 | 9:2900 |
| **MLM-** | | | | |
| 3103 | NTIS, PC A02/MF A01 | DE84002169 | STD -24 | 9:3230 |
| 3112(OP) | NTIS, PC A02/MF A01 | DE84002831 | MN -34 | 9:2901 |
| **MRC/SD-R-** | | | | |
| 103 | *See* AD-A-131274/3 | | | 9:3501 |
| **N-** | | | | |
| 8324929 | NTIS, PC A09/MF A01 | | | 9:2159 |
| 8325025 | NTIS PC $15.00 | | | 9:4262 |
| 8325026 | NTIS, PC A07/MF A01 | | | 9:2116 |
| 8325028 | NTIS, PC A12/MF A01 | | | 9:2117 |
| 8325029 | NTIS, PC A12/MF A01 | | | 9:2118 |
| 8325030 | NTIS, PC A12/MF A01 | | | 9:2119 |
| 8325031 | NTIS, PC A12/MF A01 | | | 9:2120 |
| 8325032 | NTIS, PC A12/MF A01 | | | 9:2121 |
| 8325033 | NTIS, PC A12/MF A01 | | | 9:2122 |
| 8325034 | NTIS, PC A14/MF A01 | | | 9:2123 |
| 8325035 | NTIS, PC A02/MF A01 | | | 9:2124 |
| 8325036 | NTIS, PC A03/MF A01 | | | 9:2672 |
| 8325037 | NTIS, PC A03/MF A01 | | | 9:2193 |
| 8325038 | NTIS, PC A02/MF A01 | | | 9:2527 |
| 8325040 | NTIS, PC A05/MF A01 | | | 9:2139 |
| 8325043 | NTIS, PC A03/MF A01 | | | 9:2673 |
| 8325044 | NTIS, PC A03/MF A01 | | | 9:2188 |
| 8325045 | NTIS, PC A05/MF A01 | | | 9:2528 |
| 8325048 | NTIS, PC A02/MF A01 | | | 9:2518 |
| 8325069 | NTIS, PC A17/MF A01 | | | 9:2619 |
| 8325073 | NTIS, PC A17/MF A01 | | | 9:2620 |
| 8325076 | NTIS, PC A17/MF A01 | | | 9:2151 |
| 8325079 | NTIS, PC A17/MF A01 | | | 9:2519 |
| 8325083 | NTIS, PC A17/MF A01 | | | 9:2152 |
| 8325091 | NTIS, PC A17/MF A01 | | | 9:2520 |
| 8326441 | NTIS, PC A07 | | | 9:3459 |
| 8326755 | Committee on Appropriations (US Senate), Washington, DC | | | 9:2560 |
| 8326760 | NTIS, PC A05/MF A01 | | | 9:2638 |
| 8326763 | NTIS, PC A05/MF A01 | | | 9:2667 |
| 8326765 | NTIS, PC A04/MF A01 | | | 9:2675 |
| 8326775 | NTIS, PC A03/MF A01 | | | 9:3460 |
| 8326780 | NTIS, PC A03/MF A01 | | | 9:3461 |
| 8327879 | NTIS, PC A03/MF A01 | | | 9:2831 |
| 8327903 | NTIS, PC A18/MF A01 | | | 9:3208 |
| 8327922 | NTIS, PC A04/MF A01 | | | 9:2563 |
| 8327923 | NTIS, PC A03/MF A01 | | | 9:2668 |
| 8327928 | NTIS, PC A04/MF A01 | | | 9:3462 |
| 8327929 | NTIS, PC A04/MF A01 | | | 9:3463 |
| 8327930 | NTIS, PC A04/MF A01 | | | 9:3464 |
| 8327931 | NTIS, PC A04/MF A01 | | | 9:3465 |
| 8327932 | NTIS, PC A04/MF A01 | | | 9:3466 |
| 8327933 | NTIS, PC A04/MF A01 | | | 9:3467 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 8327934 | NTIS, PC A04/MF A01 | | | 9:3468 |
| 8327935 | NTIS, PC A04/MF A01 | | | 9:3469 |
| 8327936 | NTIS, PC A04/MF A01 | | | 9:3470 |
| 8327937 | NTIS, PC A04/MF A01 | | | 9:3471 |
| 8327945 | AN SSSR, Moscow | | | 9:3472 |
| 8327948 | NTIS, PC A03/MF A01 | | | 9:3473 |
| **NASA-CR-** | | | | |
| 3696 | *See* N-8327879 | | | 9:2831 |
| 167881 | *See* DOE/NASA/0250-1 | DE84002143 | STD -94cb | 9:2525 |
| 168042 | *See* N-8327923 | | | 9:2668 |
| 168087 | *See* DOE/NASA/0254-1 | DE84002197 | STD -96 | 9:2671 |
| 168104 | *See* N-8326763 | | | 9:2667 |
| 168152 | *See* N-8325043 | | | 9:2673 |
| 170185 | *See* N-8325026 | | | 9:2116 |
| 170316 | *See* N-8325035 | | | 9:2124 |
| 170318 | *See* N-8325034 | | | 9:2123 |
| 170400 | *See* N-8326760 | | | 9:2638 |
| 170754 | *See* N-8325040 | | | 9:2139 |
| **NASA-SP-** | | | | |
| 7043(36) | *See* N-8325025 | | | 9:4262 |
| **NASA-TM-** | | | | |
| 82999 | *See* N-8325036 | | | 9:2672 |
| 83310 | *See* N-8325037 | | | 9:2193 |
| 83375 | *See* N-8325038 | | | 9:2527 |
| 83403 | *See* DOE/NASA/17088-4 | DE84002166 | STD -93 | 9:2590 |
| 84964 | *See* N-8326780 | | | 9:3461 |
| 85027 | *See* N-8327928 | | | 9:3462 |
| 85346 | *See* N-8327903 | | | 9:3208 |
| **NBSIR-** | | | | |
| 83-2722 | *See* PB-83-239566 | | | 9:3033 |
| **NE-** | | | | |
| 1983-10 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83751416 | MN -90i | 9:1816 |
| 1983-14 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83751423 | MN -98F | 9:2578 |
| 1983-15 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751419 | MN -60 | 9:2189 |
| **NE/FBA-** | | | | |
| 83-5 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83751424 | MN -25 | 9:3117 |
| **NEANDC-** | | | | |
| J-91/ U | NTIS (US Sales Only), PC A10/MF A01; 1 | DE84900011 | MN -34C | 9:3915 |
| **NIIAR-** | | | | |
| 16(531) | NTIS (US Sales Only), PC A02/MF A01 | DE83703780 | MN -79 | 9:2393 |
| **NIIEFA-P-B-** | | | | |
| 0558 | NTIS (US Sales Only), PC A02/MF A01 | DE84700036 | MN -20 | 9:4185 |
| 0573 | NTIS (US Sales Only), PC A02/MF A01 | DE83703996 | MN -20 | 9:4186 |
| **NIIEFA-P-G-** | | | | |
| 0555 | NTIS (US Sales Only), PC A02/MF A01 | DE83703997 | MN -20 | 9:4187 |
| **NIIEFA-P-K-** | | | | |
| 0570 | NTIS (US Sales Only), PC A03/MF A01 | DE84700037 | MN -20 | 9:4078 |
| **NIIEFA-P-OM-** | | | | |
| 0542 | NTIS (US Sales Only), PC A02/MF A01 | DE84700038 | MN -20 | 9:4188 |
| 0550 | NTIS (US Sales Only), PC A02/MF A01 | DE83703998 | MN -20 | 9:4189 |
| **NP-** | | | | |
| 3751465 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751465 | MN -92 | 9:1852 |
| 3770411 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83770411 | MN -96 | 9:2669 |
| 3770412 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83770412 | MN -95d | 9:2621 |
| 3770413 | NTIS (US Sales Only), PC A07/MF A01 | DE83770413 | MN -66 | 9:2167 |
| 3770414 | NTIS (US Sales Only), PC A02/MF A01 | DE83770414 | MN -98F | 9:2556 |
| 3770415 | NTIS (US Sales Only), PC A02/MF A01; 1 | DE83770415 | MN -98F | 9:2557 |
| 3770416 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83770416 | MN -98F | 9:2558 |
| 3770417 | NTIS (US Sales Only), PC A02/MF A01; 1 | DE83770417 | MN -92 | 9:2564 |
| 3770418 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83770418 | MN -97b | 9:2574 |
| 3770419 | NTIS (US Sales Only), PC A03/MF A01 | DE83770419 | MN -92 | 9:2565 |
| 3770421 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83770421 | MN -90c | 9:1773 |
| 3770422 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83770422 | MN -11 | 9:2978 |
| 3770423 | NTIS (US Sales Only), PC A11/MF A01; 1 | DE83770423 | MN -4 | 9:2902 |
| 3770424 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83770424 | MN -90 | 9:1798 |
| 3770425 | NTIS (US Sales Only), PC A07/MF A01 | DE83770425 | MN -4 | 9:3111 |
| 3770426 | NTIS (US Sales Only), PC A08/MF A01; 1 | DE83770426 | MN -92a | 9:1774 |
| 3770427 | NTIS (US Sales Only), PC A06/MF A01; 1 | DE83770427 | MN -61a | 9:2662 |
| 3770428 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83770428 | MN -38 | 9:2194 |
| 3770429 | NTIS (US Sales Only), PC A07/MF A01; 1 | DE83770429 | MN -4 | 9:2916 |
| 3770430 | NTIS (US Sales Only), PC A07/MF A01 | DE83770430 | MN -4 | 9:2917 |
| 4900033 | NTIS, PC A08/MF A01; 1 | DE84900033 | MN -95d | 9:2622 |
| 4900134 | NTIS, PC A06/MF A01; 1 | DE84900134 | MN -95d | 9:2623 |
| 4900240 | NTIS, PC A08/MF A01; 1 | DE84900240 | MN -95d | 9:2624 |
| 4900253 | NTIS, PC A04/MF A01 | DE84900253 | MN -95d | 9:2625 |
| **NRL-MR-** | | | | |
| 5161 | NTIS, PC A03/MF A01 | DE84002742 | STD -21 | 9:4190 |
| 5186 | NTIS, PC A02/MF A01 | DE84002743 | STD -21 | 9:4191 |
| **NUREG-** | | | | |
| 0750-Vol.17-No.1 | NTIS, PC A04/MF A01 - GPO | DE84900284 | MN -80 | 9:2308 |
| 0750-Vol.17-No.2 | NTIS, PC A12/MF A01 - GPO | DE84900281 | MN -80 | 9:2309 |
| 1020-Vol.1 | NTIS, PC A06/MF A01 - GPO $5.00 | DE84900048 | MN -78 | 9:2310 |
| 1020-Vol.2-App. | NTIS, PC A99/MF A01 - GPO $14.00; 1 | DE84900047 | MN -78 | 9:2311 |
| **NUREG/BR-** | | | | |
| 0051-Vol.5-No.1 | NTIS, PC A03/MF A01 - GPO | DE84900272 | MN -80 | 9:2444 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| **NUREG/CR-** | | | | |
| 3370 | NTIS, PC A03/MF A01; 1 - GPO $3.75 | DE84900263 | MN -80 | 9:2394 |
| 3417 | NTIS, PC A04/MF A01 - GPO | DE84002341 | MN -78 | 9:2445 |
| 3467 | NTIS, PC A06/MF A01; - GPO | DE84002464 | MN -92a | 9:1827 |
| **NVO-** | | | | |
| 263 | NTIS, PC A09/MF A01 | DE84002240 | STD -70 | 9:1993 |
| 266 | NTIS, PC A06/MF A01 | DE84002824 | STD -70 | 9:1994 |
| 267 | NTIS, PC A04/MF A01 | DE84002825 | STD -70 | 9:1995 |
| 268 | NTIS, PC A03/MF A01 | DE84002817 | STD -70 | 9:2051 |
| 269 | NTIS, PC A05/MF A01; 1 | DE84002818 | STD -70 | 9:2052 |
| **NWC-TM-** | | | | |
| 4898 | *See* AD-A-131460/8 | | | 9:2155 |
| **NYU/DAS-** | | | | |
| 80-20 | NTIS, PC A03/MF A01; 1 | DE84000358 | MN -95 | 9:2626 |
| **OEFZS-** | | | | |
| 4203 | NTIS (US Sales Only), PC A06/MF A01 | DE83703745 | MN -23 | 9:3195 |
| 4206 | NTIS (US Sales Only), PC A02/MF A01 | DE83703747 | MN -38 | 9:3196 |
| 4214 | NTIS (US Sales Only), PC A04/MF A01 | DE83703812 | MN -70 | 9:1996 |
| 4215 | NTIS (US Sales Only), PC A04/MF A01 | DE83703813 | MN -70 | 9:1997 |
| 4216 | NTIS (US Sales Only), PC A04/MF A01 | DE83703814 | MN -70 | 9:1998 |
| 4218 | NTIS (US Sales Only), PC A02/MF A01 | DE83703746 | MN -34A | 9:2832 |
| **OEFZS-A-** | | | | |
| 0404 | OEFZS, A-2444 Seibersdorf, Austria | | | 9:3100 |
| **ORNL-** | | | | |
| 5933 | NTIS, PC A09/MF A01 | DE84000647 | STD -10 | 9:4243 |
| 5957 | NTIS, PC A10/MF A01; 1 | DE84002979 | STD -41 | 9:4277 |
| 5986 | NTIS, PC A04/MF A01 | DE84002266 | STD -79d | 9:2288 |
| **ORNL/CON-** | | | | |
| 118 | NTIS, PC A02/MF A01 | DE84002989 | STD -95d | 9:2627 |
| 142 | NTIS, PC A03/MF A01 | DE84002991 | MN -95e | 9:2628 |
| **ORNL/CSD-** | | | | |
| 126 | NTIS, PC A03/MF A01 | DE84002997 | STD -32 | 9:4248 |
| **ORNL/Sub-** | | | | |
| 80-7800/ 2 | NTIS, PC A05/MF A01 | DE84002988 | MN -95d | 9:2629 |
| **ORNL/TM-** | | | | |
| 8414 | NTIS, PC A03/MF A01 | DE84002500 | MN -41 | 9:3269 |
| 8697 | NTIS, PC A05/MF A01 | DE84002975 | MN -41 | 9:3980 |
| 8713 | NTIS, PC A03/MF A01 | DE84002261 | STD -20f | 9:4079 |
| 8810 | *See* AD-A-131527/4 | | | 9:3262 |
| 8819 | NTIS, PC A03/MF A01 | DE84002998 | STD -95 | 9:2654 |
| 8826 | NTIS, PC A02/MF A01 | DE84002249 | STD -20c | 9:4192 |
| 8837 | NTIS, PC A04/MF A01; 1 | DE84002269 | STD -20g | 9:4080 |
| 8840 | NTIS, PC A04/MF A01 | DE84002977 | STD -94a | 9:2521 |
| 8871 | NTIS, PC A05/MF A01 | DE84002976 | STD -20g | 9:4081 |
| 8874 | NTIS, PC A03/MF A01 | DE84002973 | STD -20 | 9:4082 |
| **ORNL-tr-** | | | | |
| 5043 | NTIS, PC A11/MF A01 | DE84002355 | MN -86 | 9:1938 |
| **ORO-** | | | | |
| 838 | NTIS, PC A14/MF A01; 1 | DE84002136 | MN -92 | 9:1869 |
| **OUEL-** | | | | |
| 1254/ 78 | *See* PB-83-241414 | | | 9:2918 |
| 1277/ 79 | *See* PB-83-241422 | | | 9:2919 |
| **PATENTS-US-** | (US: Commissioner of Patents, Washington, D.C. 20231, USA, $1.00 per copy. Government Patent Applications available from NTIS) | | | |
| 4,388,267 | | | | 9:2340 |
| 4,388,579 | | | | 9:2198 |
| 4,389,063 | | | | 9:3075 |
| 4,389,377 | | | | 9:2867 |
| 4,389,466 | | | | 9:2530 |
| 4,389,467 | | | | 9:2592 |
| 4,389,617 | | | | 9:3086 |
| 4,390,777 | | | | 9:2727 |
| **PB-** | | | | |
| 83-145102 | *See* N-8326765 | | | 9:2675 |
| 83-232140 | NTIS, PC A10/MF A01 | | | 9:1799 |
| 83-232207 | NTIS, PC A04/MF A01 | | | 9:1808 |
| 83-233387 | NTIS, PC A04/MF A01 | | | 9:1809 |
| 83-234997 | NTIS, PC A14/MF A01 | | | 9:1918 |
| 83-237214 | NTIS, PC A02/MF A01 | | | 9:2543 |
| 83-237354 | NTIS, PC A05/MF A01 | | | 9:1812 |
| 83-238519 | NTIS, PC A05/MF A01 | | | 9:1800 |
| 83-239566 | NTIS, PC A07/MF A01 | | | 9:3033 |
| 83-240432 | NTIS, PC A02/MF A01 | | | 9:3289 |
| 83-240861 | NTIS PC E03/MF E03 | | | 9:2903 |
| 83-240879 | NTIS PC E07/MF E07 | | | 9:2000 |
| 83-241349 | NTIS PC E05/MF E01 | | | 9:3436 |
| 83-241414 | NTIS PC E03/MF E03 | | | 9:2918 |
| 83-241422 | NTIS PC E04/MF E04 | | | 9:2919 |
| 83-241562 | NTIS PC E05/MF E05 | | | 9:2448 |
| 83-241737 | NTIS, PC A07/MF A01 | | | 9:3290 |
| 83-241968 | NTIS PC E03/MF E03 | | | 9:3270 |
| 83-242305 | NTIS, PC A06/MF A01 | | | 9:1895 |
| 83-242313 | NTIS, PC A07/MF A01 | | | 9:1896 |
| 83-242388 | NTIS PC E04/MF E04 | | | 9:3543 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 83-242412 | NTIS PC E04/MF E04 | | | 9:3383 |
| 83-242628 | NTIS, PC A24/MF A01 | | | 9:1776 |
| 83-242636 | NTIS, PC A06/MF A01 | | | 9:2080 |
| 83-243139 | NTIS, PC A05/MF A01 | | | 9:2160 |
| 83-243246 | NTIS, PC A02/MF A01 | | | 9:3418 |
| 83-243717 | NTIS, PC A07/MF A01 | | | 9:1810 |
| 83-243964 | NTIS, PC A03/MF A01 | | | 9:1777 |
| 83-243972 | NTIS, PC A05/MF A01 | | | 9:1876 |
| 83-243980 | NTIS, PC A06/MF A01 | | | 9:1793 |
| 83-244004 | NTIS, PC A04/MF A01 | | | 9:1877 |
| 83-244012 | NTIS, PC A03/MF A01 | | | 9:3057 |
| 83-244020 | NTIS, PC A08/MF A01 | | | 9:1778 |
| 83-244038 | NTIS, PC A03/MF A01 | | | 9:1813 |
| 83-244475 | NTIS PC E03/MF E01 | | | 9:1910 |
| 83-245498 | NTIS, PC A03/MF A01 | | | 9:2001 |
| 83-246058 | NTIS, PC A04/MF A01 | | | 9:3419 |
| 83-246983 | NTIS, PC A06/MF A01 | | | 9:3339 |
| 83-247148 | NTIS, PC A10/MF A01 | | | 9:1857 |
| 83-249375 | NTIS, PC A03/MF A01 | | | 9:3343 |
| 83-249458 | NTIS, PC A07/MF A01 | | | 9:1884 |
| 83-249490 | NTIS, PC A04/MF A01 | | | 9:2081 |
| 83-249516 | NTIS, PC A02/MF A01 | | | 9:2082 |
| 83-250001 | NTIS, PC A04/MF A01 | | | 9:1779 |
| 83-250118 | NTIS, PC A03/MF A01 | | | 9:1801 |
| 83-250340 | NTIS, PC A03/MF A01 | | | 9:3271 |
| 83-250852 | NTIS, PC A03/MF A01 | | | 9:1811 |
| 83-250894 | NTIS, PC A03/MF A01 | | | 9:3291 |
| 83-250902 | NTIS, PC A02/MF A01 | | | 9:1802 |
| 83-251199 | NTIS, PC A05/MF A01 | | | 9:2100 |
| 83-251488 | NTIS PC E07/MF E07 | | | 9:2074 |
| 83-251850 | NTIS, PC A25/MF A01 | | | 9:1805 |
| 83-252502 | NTIS, PC A04/MF A01 | | | 9:3281 |
| 83-252825 | NTIS, PC A05/MF A01 | | | 9:3272 |
| 83-252833 | NTIS, PC A06/MF A01 | | | 9:1803 |
| 83-253740 | NTIS, PC A03/MF A01 | | | 9:1806 |
| 83-253765 | NTIS PC E03/MF E03 | | | 9:1794 |
| 83-254920 | NTIS, PC A05/MF A01 | | | 9:1879 |
| 83-254938 | NTIS, PC A06/MF A01 | | | 9:1780 |
| 83-256644 | NTIS, PC A03/MF A01 | | | 9:2083 |
| 83-256651 | NTIS, PC A03/MF A01 | | | 9:1880 |
| 83-256677 | NTIS, PC A02/MF A01 | | | 9:2084 |
| 83-256685 | NTIS, PC A07/MF A01 | | | 9:2085 |
| **PH-** | | | | |
| 365/ 83 | *See* OEFZS-A-0404 | | | 9:3100 |
| 369/ 83 | *See* OEFZS-4218 | DE83703746 | MN -34A | 9:2832 |
| **PNC-N-** | | | | |
| 343-82-01 | NTIS (US Sales Only), PC A03/MF A01 | DE83703778 | MN -80 | 9:2275 |
| 941-81-239 | NTIS (US Sales Only), PC A04/MF A01 | DE83703781 | MN -79 | 9:2395 |
| **PNL-** | | | | |
| 4179 | NTIS, PC A04/MF A01 | DE84003341 | MN -95d | 9:2630 |
| 4581-App.A-B | NTIS, PC A09/MF A01 | DE84002627 | MN -11 | 9:2544 |
| 4800 | NTIS, PC A10/MF A01; 1 | DE84002167 | MN -70 | 9:2002 |
| 4822 | NTIS, PC A05/MF A01; 1 | DE84002190 | MN -11 | 9:3280 |
| 4903 | NTIS, PC A02/MF A01 | DE84000676 | MN -2 | 9:3044 |
| **PNL-SA-** | | | | |
| 9942-Rev. | NTIS, PC A02/MF A01 | DE84002548 | MN -48 | 9:3420 |
| 10347-Vol.1 | *See* N-8325048 | | | 9:2518 |
| 10347-Vol.2 | *See* N-8325048 | | | 9:2518 |
| 11136 | NTIS, PC A02/MF A01 | DE84001342 | MN -70 | 9:2003 |
| 11214 | NTIS, PC A03/MF A01; 1 | DE83017869 | MN -78 | 9:2449 |
| 11441 | NTIS, PC A02/MF A01 | DE84002587 | MN -70B | 9:2066 |
| 11447 | NTIS, PC A02/MF A01 | DE84002595 | MN -61 | 9:2086 |
| 11536 | NTIS, PC A02/MF A01; 1 | DE84002596 | MN -78 | 9:2450 |
| 11539 | NTIS, PC A02/MF A01; 1 | DE84002581 | MN -32 | 9:4263 |
| 11541 | NTIS, PC A02/MF A01 | DE84002594 | MN -70B | 9:2004 |
| **RA-** | | | | |
| 82-0115 | *See* PB-83-249458 | | | 9:1884 |
| **RAND/N-** | | | | |
| 1903-DOE | *See* N-8327922 | | | 9:2563 |
| **REC-ERC-** | | | | |
| 83-2 | *See* PB-83-251199 | | | 9:2100 |
| **REPT-** | | | | |
| 757 | *See* N-8327945 | | | 9:3472 |
| **RFP-** | | | | |
| 3511 | NTIS, PC A05/MF A01 | DE84002475 | STD -4 | 9:1936 |
| **RFP-Trans-** | | | | |
| 414 | NTIS, PC A02/MF A01 | DE84002811 | MN -25 | 9:2774 |
| 416 | NTIS, PC A02/MF A01 | DE84002812 | MN -25 | 9:2717 |
| **RHO-PB-SR-** | | | | |
| 10-B-CP-Sept.83 | NTIS, PC A04/MF A01; 1 | DE84001905 | MN -4 | 9:1937 |
| **RIG-** | | | | |
| 13 | NTIS (US Sales Only), PC A03/MF A01 | DE83703837 | MN -2 | 9:2322 |
| **RL-** | | | | |
| 82-036 | *See* PB-83-242412 | | | 9:3383 |
| 82-080 | NTIS (US Sales Only), PC A02/MF A01 | DE83703798 | MN -37 | 9:3197 |

| Report No. | Availability | Order No. | Distribution Category | Abstract No. |
|---|---|---|---|---|
| 82-116 | NTIS (US Sales Only), PC A02/MF A01 | DE83703999 | MN -20 | 9:4083 |
| 83-030 | *See* PB-83-242388 | | | 9:3543 |
| **RR-** | | | | |
| 46 | *See* PB-83-256644 | | | 9:2083 |
| **RS-** | | | | |
| 215/ 83 | *See* OEFZS-4206 | DE83703747 | MN -38 | 9:3196 |
| **SAI-** | | | | |
| 83/ 1104 | *See* DOE/ET/34072-2 | DE84002326 | STD -78 | 9:2315 |
| 133-82-232-LJ | *See* AD-A-130931/9 | | | 9:3278 |
| **SAND-** | | | | |
| 82-0998 | NTIS, PC A04/MF A01; 1 | DE84002165 | STD -71 | 9:2072 |
| 83-0110 | NTIS, PC A06/MF A01 | DE84002147 | MN -28 | 9:3157 |
| 83-0866C | NTIS, PC A02/MF A01 | DE84000044 | MN -71 | 9:1944 |
| 83-0930C | NTIS, PC A02/MF A01 | DE84002539 | MN -34 | 9:2833 |
| 83-1214 | NTIS, PC A04/MF A01 | DE84003154 | MN -51 | 9:1914 |
| 83-1401C | NTIS MF A01; 2 | DE84001790 | MN -32 | 9:4249 |
| 83-1409C | NTIS, PC A02/MF A01 | DE84002802 | MN -34A | 9:3971 |
| 83-1418C | NTIS, PC A02/MF A01 | DE84002107 | MN -34 | 9:2834 |
| 83-1829C | NTIS, PC A02/MF A01 | DE84002540 | MN -78 | 9:2451 |
| 83-1851C | NTIS, PC A02/MF A01 | DE84002043 | MN -78 | 9:2452 |
| 83-1852C | NTIS, PC A02/MF A01; 1 | DE84002045 | MN -78 | 9:2453 |
| 83-1881C | NTIS, PC A02/MF A01 | DE84002538 | MN -78 | 9:2454 |
| 83-1890C | NTIS, PC A02/MF A01; 1 | DE84002041 | MN -78 | 9:2455 |
| 83-1900 | NTIS PC E05/MF A01; 1 | DE84002306 | MN -13 | 9:3101 |
| 83-2013C | NTIS, PC A02/MF A01; 1 | DE84002731 | MN -38 | 9:3072 |
| 83-2074 | NTIS, PC A07/MF A01 | DE84002758 | MN -62 | 9:2146 |
| 83-2080C | NTIS, PC A02/MF A01 | DE84000043 | MN -78 | 9:2456 |
| 83-2137 | NTIS, PC A03/MF A01 | DE84001364 | MN -92a | 9:1897 |
| 83-2148C | NTIS, PC A02/MF A01 | DE84001055 | MN -25 | 9:3215 |
| 83-2164C | NTIS, PC A02/MF A01; 1 | DE84000942 | MN -32 | 9:4250 |
| 83-2234C | NTIS, PC A02/MF A01 | DE84002537 | MN -25 | 9:2904 |
| 83-2245C | NTIS, PC A02/MF A01 | DE84002040 | MN -78 | 9:2457 |
| 83-2251C | NTIS, PC A03/MF A01; 1 | DE84002384 | MN -80 | 9:2458 |
| 83-2252C | NTIS, PC A02/MF A01 | DE84001759 | MN -80 | 9:2459 |
| 83-2276C | NTIS, PC A02/MF A01 | DE84002611 | MN -25 | 9:2835 |
| 83-2298C | NTIS, PC A02/MF A01 | DE84001768 | MN -38 | 9:3106 |
| 83-7020 | NTIS, PC A11/MF A01; 1 | DE84002971 | MN -63c | 9:2125 |
| 83-7120 | NTIS, PC A08/MF A01; 1 | DE84002891 | MN -92a | 9:1828 |
| 83-7440 | NTIS, PC A03/MF A01 | DE84002137 | STD -66c | 9:2176 |
| 83-8024 | NTIS, PC A02/MF A01 | DE84002194 | MN -25 | 9:2712 |
| **SERI/PR-** | | | | |
| 02085-1-T2 | NTIS, PC A02/MF A01 | DE83013857 | MN -63c | 9:2126 |
| 02085-1-T3 | NTIS, PC A02/MF A01 | DE83013858 | MN -63c | 9:2127 |
| **SERI/TP-** | | | | |
| 215-2009 | NTIS, PC A02/MF A01; 1 | DE84000013 | MN -60 | 9:2186 |
| 255-2091 | NTIS, PC A02/MF A01 | DE84000016 | MN -62e | 9:2149 |
| **SERI/TR-** | | | | |
| 231-2000 | NTIS, PC A06/MF A01 | DE84000007 | STD -61a | 9:2090 |
| 252-1765 | NTIS, PC A03/MF A01 | DE84000004 | STD -64 | 9:2182 |
| 253-1906 | NTIS, PC A03/MF A01 | DE84000005 | STD -59 | 9:2150 |
| 8058-2-T5 | NTIS, PC A07/MF A01 | DE84002097 | STD -63c | 9:2128 |
| 9002-2-T1 | NTIS, PC A03/MF A01 | DE84002101 | STD -63c | 9:2129 |
| **SERP-E-** | | | | |
| 78/ E-043 | *See* IFVE-OEIPK-82-153 | DE84700054 | MN -34D | 9:3629 |
| **SGU-** | | | | |
| 29 | *See* PB-83-241349 | | | 9:3436 |
| **SI-R-** | | | | |
| 780410-6 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751462 | MN -64 | 9:2183 |
| **SLAC-** | | | | |
| 262 | NTIS, PC A04/MF A01 | DE84002349 | STD -34D | 9:3713 |
| **SLAC-PUB-** | | | | |
| 3129 | NTIS, PC A03/MF A01 | DE84002034 | MN -34D | 9:3714 |
| 3136 | NTIS, PC A03/MF A01 | DE84002375 | MN -34D | 9:3777 |
| 3202 | NTIS, PC A02/MF A01 | DE84002020 | MN -34D | 9:3715 |
| 3219 | NTIS, PC A02/MF A01 | DE84002082 | MN -28 | 9:3778 |
| 3235 | NTIS, PC A02/MF A01 | DE84002759 | MN -28 | 9:3198 |
| 3236 | NTIS, PC A02/MF A01 | DE84002760 | MN -28 | 9:3199 |
| 3237 | NTIS, PC A02/MF A01 | DE84002761 | MN -28 | 9:3200 |
| 3249 | NTIS, PC A02/MF A01 | DE84002677 | MN -34D | 9:3779 |
| **SNV-PM-** | | | | |
| 1631 | NTIS (US Sales Only), PC A05/MF A01 | DE83751417 | MN -11 | 9:3332 |
| **STF-** | | | | |
| 15A81020 | NTIS (US Sales Only), PC A09/MF A01; 1 | DE83751460 | MN -61a | 9:2098 |
| **STUDSVIK-** | | | | |
| 83-3 | NTIS (US Sales Only), PC A04/MF A01; 1 | DE83751421 | MN -95e | 9:2663 |
| **STUDSVIK-EI-** | | | | |
| 83-17 | *See* NE/FBA-83-5 | DE83751424 | MN -25 | 9:3117 |
| **TC-** | | | | |
| 3547-1 | *See* PB-83-241737 | | | 9:3290 |
| **TR-** | | | | |
| 4 | *See* AD-A-132044/9 | | | 9:3030 |
| 37-ONR | *See* AD-A-130716/4 | | | 9:2104 |
| 38-ONR | *See* AD-A-130666/1 | | | 9:3003 |
| **TRI-PP-** | | | | |
| 83-64 | NTIS (US Sales Only), PC A02/MF A01; 1 | DE84900201 | MN -34D | 9:3820 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| **TRITA-EPP-** | | | | |
| 82-04 | NTIS (US Sales Only), PC A03/MF A01 | DE83704000 | MN -20 | 9:3474 |
| **TRITA-PFU-** | | | | |
| 80-10 | NTIS (US Sales Only), PC A02/MF A01 | DE83704001 | MN -20 | 9:4193 |
| **TULEA-** | | | | |
| 1981:28 | *See* N-8325048 | | | 9:2518 |
| **TVA/OACD-** | | | | |
| 83/ 15 | NTIS, PC A06/MF A01; 1 | DE84900074 | MN -13 | 9:2545 |
| **TVA/PUB-** | | | | |
| 84/ 3 | NTIS, PC A04/MF A01 | DE84900076 | MN -11 | 9:2546 |
| 84/ 6 | NTIS, PC A03/MF A01 | DE84900355 | MN -90i | 9:1804 |
| **UCID-** | | | | |
| 19075-Vol.2 | NTIS, PC A99/MF A01; 1 | DE84002466 | MN -92b | 9:1885 |
| 19822-Rev.1 | NTIS, PC A04/MF A01; 1 | DE84002108 | MN -11 | 9:3273 |
| 19903 | NTIS, PC A03/MF A01 | DE84002474 | MN -21 | 9:4194 |
| 19917 | NTIS, PC A04/MF A01; 1 | DE84002146 | MN -91 | 9:1909 |
| 19918 | NTIS, PC A03/MF A01; 1 | DE84002195 | MN -38 | 9:3107 |
| 19919 | NTIS, PC A02/MF A01 | DE84002145 | MN -38 | 9:4251 |
| 19923 | NTIS, PC A07/MF A01; 1 | DE84002112 | MN -11 | 9:3443 |
| 19926 | NTIS, PC A03/MF A01; 1 | DE84002110 | MN -70 | 9:2005 |
| 19928 | NTIS, PC A02/MF A01 | DE84002111 | MN -11 | 9:3437 |
| **UCRL-** | | | | |
| 15496 | NTIS, PC A03/MF A01 | DE84002775 | MN -71 | 9:3073 |
| 15549 | NTIS, PC A06/MF A01 | DE84002774 | MN -94cc | 9:2529 |
| 15559-Vol.1 | NTIS, PC A03/MF A01; 1 | DE84001682 | MN -38 | 9:3082 |
| 15559-Vol.2 | NTIS, PC A12/MF A01; 1 | DE84002328 | MN -38 | 9:3083 |
| 15560 | NTIS, PC A02/MF A01 | DE84002789 | MN -70 | 9:2006 |
| 15561 | NTIS, PC A04/MF A01; 1 | DE84002784 | MN -21 | 9:3084 |
| 15562 | NTIS, PC A16/MF A01; 1 | DE84002340 | MN -94b | 9:2674 |
| 15564 | NTIS, PC A02/MF A01 | DE84002786 | MN -34 | 9:3544 |
| 53485 | *See* NUREG/CR-3467 | DE84002464 | MN -92a | 9:1827 |
| 86246 | NTIS, PC A02/MF A01; 1 | DE84002713 | MN -80 | 9:2212 |
| 86248 | NTIS, PC A03/MF A01 | DE84001235 | MN -11 | 9:3438 |
| 87469 | NTIS, PC A03/MF A01 | DE84002773 | MN -38 | 9:2713 |
| 88041 | NTIS, PC A02/MF A01; 1 | DE84002792 | MN -41 | 9:3981 |
| 88495-REV.1 | NTIS, PC A02/MF A01 | DE84003003 | MN -92 | 9:1886 |
| 88669 | NTIS, PC A02/MF A01; 1 | DE84002790 | MN -21 | 9:4195 |
| 88672 | NTIS, PC A02/MF A01 | DE84001424 | MN -38 | 9:3108 |
| 88690 | NTIS, PC A02/MF A01 | DE84002794 | MN -21 | 9:4196 |
| 88913 | NTIS, PC A02/MF A01 | DE84002779 | MN -32 | 9:4252 |
| 88921 | NTIS, PC A02/MF A01; 1 | DE84002453 | MN -28 | 9:3143 |
| 88961 | NTIS, PC A04/MF A01; 1 | DE84001423 | MN -35 | 9:3258 |
| 89195 | NTIS, PC A03/MF A01 | DE83018180 | MN -20c | 9:4197 |
| 89214 | NTIS, PC A02/MF A01 | DE84002455 | MN -28 | 9:3158 |
| 89298 | NTIS, PC A02/MF A01 | DE84002463 | MN -38 | 9:3102 |
| 89307 | NTIS, PC A02/MF A01 | DE84001782 | MN -92 | 9:1887 |
| 89327 | NTIS, PC A02/MF A01 | DE84002722 | MN -20 | 9:4198 |
| 89397 | NTIS, PC A02/MF A01 | DE84002714 | MN -34 | 9:4021 |
| 89570 | NTIS, PC A02/MF A01; 1 | DE84002780 | MN -21 | 9:4084 |
| 89632 | NTIS, PC A02/MF A01 | DE84002467 | MN -41 | 9:3201 |
| 89753 | NTIS, PC A02/MF A01 | DE84002468 | MN -34A | 9:3545 |
| 89797 | NTIS, PC A02/MF A01 | DE84002469 | MN -38 | 9:2396 |
| 89844 | NTIS, PC A02/MF A01 | DE84002727 | MN -20 | 9:4199 |
| 89894 | NTIS, PC A02/MF A01 | DE84002459 | MN -38 | 9:4253 |
| 89923 | NTIS, PC A03/MF A01 | DE84001781 | MN -4 | 9:3089 |
| 89964 | NTIS, PC A02/MF A01 | DE84002723 | MN -11 | 9:3274 |
| 89969 | NTIS, PC A02/MF A01 | DE84002785 | MN -32 | 9:4254 |
| 89993 | NTIS, PC A02/MF A01 | DE84003021 | MN -34A | 9:3546 |
| **UCRL-Trans-** | | | | |
| 11916 | NTIS, PC A09/MF A01; 1 | DE84003041 | MN -38 | 9:3103 |
| 11918 | NTIS, PC A03/MF A01; 1 | DE84002199 | MN -38 | 9:3060 |
| 11919 | NTIS, PC A02/MF A01; 1 | DE84002198 | MN -22 | 9:1921 |
| 11920 | NTIS, PC A02/MF A01 | DE84002623 | MN -22 | 9:1922 |
| 11921 | NTIS, PC A02/MF A01 | DE84002622 | MN -22 | 9:1923 |
| 11922 | NTIS, PC A02/MF A01 | DE84002621 | MN -22 | 9:1926 |
| 11923 | NTIS, PC A03/MF A01; 1 | DE84001983 | MN -22 | 9:1924 |
| **USGS-PP-** | | | | |
| 1252 | NTIS, PC A03/MF A01 - GPO | DE84900264 | MN -92a | 9:1819 |
| **UTEC-** | | | | |
| 82-075 | *See* AD-A-131372/5 | | | 9:3429 |
| **VERITAS-R-** | | | | |
| 80-0045 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751463 | MN -64 | 9:2184 |
| 81-0339 | NTIS (US Sales Only), PC A03/MF A01; 1 | DE83751464 | MN -64 | 9:2185 |
| **VTT-TIED-** | | | | |
| 159 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -96 | 9:2639 |
| 160 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -96 | 9:2640 |
| 164 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -90 | 9:2099 |
| 187 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95d | 9:2631 |
| 209 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95f | 9:2655 |
| 215 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -90d | 9:1781 |
| 216 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95 | 9:2632 |
| 221 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -92 | 9:1858 |
| **VTT-TUTK-** | | | | |
| 135 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -90 | 9:1814 |
| 137 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95 | 9:2656 |

| *Report No.* | *Availability* | *Order No.* | *Distribution Category* | *Abstract No.* |
|---|---|---|---|---|
| 148 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -61a | 9:2130 |
| 152 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95d | 9:2633 |
| 156 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | MN -61a | 9:2657 |
| 159 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -96 | 9:2641 |
| 168 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95d | 9:2634 |
| 169 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -96 | 9:2642 |
| 175 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -90 | 9:1795 |
| 179 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95 | 9:2664 |
| 181 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -95e | 9:2658 |
| 186 | Valtion Teknillinen Tutkimuskeskus, Espoo, Finland | | ND -59a | 9:2147 |
| **WIPP-DOE-** | | | | |
| 171 | NTIS, PC A02/MF A01 | DE84002667 | MN -70 | 9:2007 |
| **WIS-PH-** | | | | |
| 82/ 42 | NTIS (US Sales Only), PC A02/MF A01 | DE84700006 | MN -34D | 9:3840 |
| 82/ 55 | NTIS (US Sales Only), PC A03/MF A01 | DE84700046 | MN -34D | 9:3780 |
| 82/ 58 | NTIS (US Sales Only), PC A02/MF A01 | DE84700047 | MN -34D | 9:3841 |
| 82/ 60 | NTIS (US Sales Only), PC A03/MF A01 | DE84700048 | MN -34D | 9:3842 |
| 83/ 3 | NTIS (US Sales Only), PC A03/MF A01 | DE84700050 | MN -34D | 9:3843 |
| 83/ 4 | NTIS (US Sales Only), PC A02/MF A01 | DE84700051 | MN -34D | 9:3781 |
| 83/ 9 | NTIS (US Sales Only), PC A02/MF A01 | DE84700052 | MN -34D | 9:3782 |
| 83/ 16 | NTIS (US Sales Only), PC A02/MF A01 | DE84700012 | MN -34A | 9:4022 |
| 83/ 19 | NTIS (US Sales Only), PC A02/MF A01 | DE84700007 | MN -34D | 9:3844 |
| 83/ 21 | NTIS (US Sales Only), PC A04/MF A01 | DE84700069 | MN -34C | 9:3954 |
| 83/ 23 | NTIS (US Sales Only), PC A03/MF A01 | DE84700008 | MN -34D | 9:3845 |
| 83/ 24 | NTIS (US Sales Only), PC A02/MF A01 | DE84700009 | MN -34D | 9:3846 |
| 83/ 26 | NTIS (US Sales Only), PC A02/MF A01 | DE84700049 | MN -34D | 9:3783 |
| **Y/DZ-** | | | | |
| 77 | NTIS, PC A02/MF A01 | DE84002171 | MN -4 | 9:3112 |
| **ZfK-** | | | | |
| 477 | NTIS (US Sales Only), PC A02/MF A01 | DE83703761 | MN -25 | 9:2346 |
| 494 | NTIS (US Sales Only), PC A02/MF A01 | DE83703767 | MN -80 | 9:2213 |
| 498 | NTIS (US Sales Only), PC A02/MF A01 | DE84700070 | MN -34C | 9:3955 |

# ORDER NUMBER CORRELATION

This correlation list is provided for those organizations where document storage is alphanumeric by report number and request may be received by order number. For other information about a document (abstract number, distribution category, availability, and price), please refer to the Report Number Index.

| *Order No.* | *Report No.* |
|---|---|
| DE83001143 | IDO—10109 |
| DE83011009 | DOE/ET/20320—T1 |
| DE83012487 | DOE/ET/10143—13 |
| DE83013233 | DOE/PC/50793—T1 |
| DE83013440 | DOE/PC/50793—T2 |
| DE83013607 | DOE/PC/40782—T5 |
| DE83013857 | SERI/PR—02085-1-T2 |
| DE83013858 | SERI/PR—02085-1-T3 |
| DE83014024 | BNL-NUREG—33665 |
| DE83015350 | DOE/CS/20177—T1 |
| DE83015484 | DOE/ET/10393—1461 |
| DE83016121 | DOE/LC/10962—1 |
| DE83016306 | DOE/CE/15146—T3 |
| DE83016338 | LA—9798-P |
| DE83016541 | DOE/ER/53112—T1 |
| DE83016756 | DOE/ER/54010—T1 |
| DE83016801 | DOE/ER/53111—1 |
| DE83016802 | DOE/ER/53111—2 |
| DE83016956 | DOE/ID—12098 |
| DE83017005 | HEDL-SA—2786 |
| DE83017148 | DOE/ER/52061—1 |
| DE83017204 | CONF-830607—26 |
| DE83017284 | CONF-830812—59 |
| DE83017330 | DOE/RG/09154—T2 |
| DE83017404 | DOE/EV/03018—247 |
| DE83017597 | BNL-tr—1008 |
| DE83017704 | CONF-8305107— |
| DE83017869 | PNL-SA—11214 |
| DE83017876 | CONF-830905—6 |
| DE83017906 | DOE/ER/10058—T1 |
| DE83018126 | DOE/ER/10570—T2 |
| DE83018180 | UCRL—89195 |
| DE83018241 | BBN—3606 |
| DE83018285 | MHD-III—82-048 |
| DE83703309 | INIS-mf—8447 |
| DE83703310 | INIS-mf—8411 |
| DE83703311 | INIS-mf—8416 |
| DE83703312 | INIS-mf—8408 |
| DE83703313 | INIS-mf—8409 |
| DE83703314 | INIS-mf—8413 |
| DE83703315 | INIS-mf—8414 |
| DE83703316 | INIS-mf—8417 |
| DE83703317 | INIS-mf—8420 |
| DE83703318 | INIS-mf—8421 |
| DE83703319 | INIS-mf—8439 |
| DE83703320 | INIS-mf—8464 |
| DE83703321 | INIS-mf—8403 |
| DE83703322 | INIS-mf—8466 |
| DE83703323 | FRNC-TH—1113 |
| DE83703324 | INIS-mf—8461 |
| DE83703325 | INIS-mf—8463 |
| DE83703326 | INIS-mf—8470 |
| DE83703327 | INIS-mf—8458 |
| DE83703328 | INIS-mf—8189 |
| DE83703329 | INIS-mf—8190 |
| DE83703330 | INIS-mf—8431 |
| DE83703331 | INIS-mf—8407 |
| DE83703332 | INIS-mf—8446 |
| DE83703333 | INIS-mf—8454 |
| DE83703334 | INIS-mf—8460 |
| DE83703335 | INIS-mf—8462 |
| DE83703592 | INIS-mf—8506 |
| DE83703593 | INIS-mf—8555 |
| DE83703594 | INIS-mf—8548 |
| DE83703595 | INIS-mf—8531 |
| DE83703596 | INIS-mf—8543 |
| DE83703598 | INIS-mf—8530 |
| DE83703599 | INIS-mf—8551 |
| DE83703600 | INIS-mf—8554 |
| DE83703601 | INIS-mf—8535 |
| DE83703602 | INIS-mf—8553 |
| DE83703603 | INIS-mf—8544 |
| DE83703604 | INIS-mf—8550 |
| DE83703605 | INIS-mf—8552 |
| DE83703606 | INIS-mf—8547 |
| DE83703607 | INIS-mf—8050 |
| DE83703744 | CEA-R—5201 |
| DE83703745 | OEFZS—4203 |
| DE83703746 | OEFZS—4218 |
| DE83703747 | OEFZS—4206 |
| DE83703750 | JAERI-M—82-086 |
| DE83703751 | JINR—9-82-709 |
| DE83703752 | JINR—9-82-756 |
| DE83703753 | JINR—9-82-757 |
| DE83703754 | JINR—R-9-82-640 |
| DE83703755 | JINR—R-9-82-675 |
| DE83703756 | JINR—R-9-82-676 |
| DE83703757 | CEA-CONF—6585 |
| DE83703758 | JAERI-M—82-055 |
| DE83703759 | JAERI-M—82-068 |
| DE83703760 | JAERI-M—82-082 |
| DE83703761 | ZfK—477 |
| DE83703762 | EUR—7603 |
| DE83703763 | FEI—1336 |
| DE83703764 | FEI—1337 |
| DE83703765 | IAE—3561/4 |
| DE83703767 | ZfK—494 |
| DE83703768 | FEI—1172 |
| DE83703769 | FEI—1326 |
| DE83703770 | EUR—7373 |
| DE83703771 | EUR—7599 |
| DE83703772 | JAERI-M—82-005 |
| DE83703773 | JAERI-M—82-075 |
| DE83703774 | JAERI-M—82-076 |
| DE83703775 | CEA-CONF—6580 |
| DE83703776 | IAEA-TC—389/6-18 |
| DE83703777 | JAERI-M—82-043 |
| DE83703778 | PNC-N—343-82-01 |
| DE83703779 | FEI—1340 |
| DE83703780 | NIIAR—16(531) |
| DE83703781 | PNC-N—941-81-239 |
| DE83703782 | EUR—7931 |
| DE83703783 | JAERI-M—82-012 |
| DE83703784 | JAERI-M—82-016 |
| DE83703785 | KURRI-TR—216 |
| DE83703786 | CRN-PN—82-28 |
| DE83703787 | FEI—1347 |
| DE83703788 | IAEA-TC—389/6-13 |
| DE83703789 | IAEA-TC—389/6-19 |
| DE83703790 | INDC(GDR)—18/L |
| DE83703791 | JINR—13-82-728 |
| DE83703792 | JINR—13-82-743 |
| DE83703793 | JINR—13-82-768 |
| DE83703794 | JINR—13-82-769 |
| DE83703795 | JINR—R-10-82-690 |
| DE83703796 | JINR—R-13-82-812 |
| DE83703797 | JINR—R-9-82-724 |
| DE83703798 | RL—82-080 |
| DE83703799 | IAEA-TC—389/6-23 |
| DE83703800 | JINR—13-82-713 |
| DE83703801 | JINR—13-82-762 |
| DE83703802 | JINR—R-13-82-737 |
| DE83703803 | CEA-CONF—6624 |
| DE83703804 | AERE-G—2599 |
| DE83703805 | EUR—7338 |
| DE83703806 | EUR—7371 |
| DE83703807 | EUR—7654 |
| DE83703808 | EUR—7675 |
| DE83703809 | JAERI-M—82-088 |
| DE83703810 | EUR—7650 |
| DE83703811 | EUR—7728 |
| DE83703812 | OEFZS—4214 |
| DE83703813 | OEFZS—4215 |
| DE83703814 | OEFZS—4216 |
| DE83703815 | MINTEK-M—55 |
| DE83703816 | EUR—7836 |
| DE83703817 | EUR—7900 |
| DE83703818 | EUR—7959 |
| DE83703819 | EUR—7999 |
| DE83703820 | JAERI—1279 |
| DE83703821 | JAERI-M—82-072 |
| DE83703822 | JAERI-M—82-091 |
| DE83703823 | JAERI-M—82-099 |
| DE83703824 | JINR—11-82-739 |
| DE83703825 | JINR—R-11-82-670 |
| DE83703826 | MINTEK-M—61 |
| DE83703827 | KURRI-TR—220 |
| DE83703828 | EUR—7923 |
| DE83703829 | EUR—7926 |
| DE83703830 | EUR—8082 |
| DE83703831 | INIS-mf—8565 |
| DE83703832 | INIS-mf—8567 |
| DE83703833 | INIS-mf—8568 |
| DE83703834 | INIS-mf—8569 |
| DE83703835 | INIS-mf—8570 |
| DE83703836 | INIS-mf—8571 |
| DE83703837 | RIG—13 |
| DE83703967 | CEA-CONF—6637 |
| DE83703968 | CEA-CONF—6639 |
| DE83703969 | EFI—517(4)-82 |
| DE83703970 | EFI—530(17)-82 |
| DE83703971 | EFI—533(20)-82 |
| DE83703972 | IC—80/118 |
| DE83703973 | IC—80/123 |
| DE83703974 | IC—82/194 |
| DE83703975 | IC—82/93 |
| DE83703976 | IFVE-OTF—82-106 |
| DE83703977 | IFVE-OTF—82-113 |
| DE83703978 | IFVE-OTF—82-162 |
| DE83703979 | IFVE-OTF—82-169 |
| DE83703980 | IFVE-OTF—82-56 |
| DE83703981 | ITEP—102(1982) |
| DE83703982 | JINR—E-2-82-771 |
| DE83703983 | ANU-P—808 |
| DE83703984 | EFI—514(1)-82 |
| DE83703985 | EFI—528(15)-82 |
| DE83703986 | IAE—3468/6 |
| DE83703987 | IAE—3575/11 |
| DE83703988 | JINR—R-14-82-605 |
| DE83703989 | JINR—R-17-82-868 |
| DE83703990 | JINR—R-4-82-633 |
| DE83703991 | IAE—3525/8 |
| DE83703992 | IAE—3588/16 |
| DE83703993 | IC—82/132 |

| Order No. | Report No. |
|---|---|
| DE83703994 | INIS-mf—8577 |
| DE83703995 | ITF—82-69-R |
| DE83703996 | NIIEFA-P-B—0573 |
| DE83703997 | NIIEFA-P-G—0555 |
| DE83703998 | NIIEFA-P-OM—0550 |
| DE83703999 | RL—82-116 |
| DE83704000 | TRITA-EPP—82-04 |
| DE83704001 | TRITA-PFU—80-10 |
| DE83704002 | EFI—575(62)-82 |
| DE83704003 | ITEP—80(1982) |
| DE83704004 | JINR—E-17-82-240 |
| DE83704005 | EFI—494(37)-81 |
| DE83704006 | IC—80/116 |
| DE83704007 | IC—80/125 |
| DE83704008 | IC—80/18 |
| DE83704009 | IC—80/2 |
| DE83704010 | IC—80/26 |
| DE83704011 | IC—80/49 |
| DE83704012 | IC—80/50 |
| DE83704013 | IC—80/52 |
| DE83704014 | IC—80/54 |
| DE83704015 | IC—80/6 |
| DE83704016 | IC—80/72 |
| DE83704017 | IC—80/86 |
| DE83704018 | IC—80/88 |
| DE83704019 | IC—80/94 |
| DE83704020 | IC—81/154 |
| DE83704021 | IC—82/108 |
| DE83704022 | IC—82/111 |
| DE83704023 | IC—82/117 |
| DE83704024 | IC—82/118 |
| DE83704025 | IC—82/141 |
| DE83704026 | IC—82/145 |
| DE83704027 | IC—82/15 |
| DE83704028 | IC—82/153 |
| DE83704029 | IC—82/157 |
| DE83704030 | IC—82/222 |
| DE83704031 | IC—82/223 |
| DE83704032 | IC—82/71 |
| DE83704033 | IC—82/89 |
| DE83704034 | IC—82/91 |
| DE83704035 | IC—82/92 |
| DE83704036 | IFVE-OTF—82-112 |
| DE83704037 | IFVE-OTF—82-190 |
| DE83704038 | IFVE-OTF—82-22 |
| DE83704039 | IFVE-OTF—82-37 |
| DE83704040 | IFVE-OTF—82-38 |
| DE83704041 | IPNO-TH—82-27 |
| DE83704280 | IFUSP-P—310 |
| DE83704281 | IPNO-TH—82-46 |
| DE83704282 | IFUSP-P—313 |
| DE83704283 | IFUSP-P—301 |
| DE83704284 | IFUSP-P—302 |
| DE83704285 | IFUSP-P—304 |
| DE83704286 | JINR—E-4-82-693 |
| DE83704287 | JINR—E-4-82-694 |
| DE83704288 | CTA-EAV—001/81 |
| DE83704289 | ISN—82-50 |
| DE83704290 | JINR—E-1-82-719 |
| DE83704291 | JINR—R-7-82-638 |
| DE83704292 | AEEW-R—1588 |
| DE83704293 | INS-R—292 |
| DE83704294 | MINTEK-M—48 |
| DE83704295 | MINTEK-M—69 |
| DE83704296 | MINTEK-M—79 |
| DE83704297 | MINTEK-M—80 |
| DE83704298 | MINTEK-M—81 |
| DE83704299 | MINTEK-M—84 |
| DE83704300 | JINR—R-14-82-212 |
| DE83704301 | CEA-CONF—6618 |
| DE83704303 | KFTI—82-32 |
| DE83704304 | CEA-CONF—6652 |
| DE83704305 | CEA-CONF—6655 |
| DE83704306 | CEA-CONF—6657 |
| DE83704307 | CEA-N—2331 |
| DE83704308 | CEA-R—5204 |
| DE83704309 | CEA-R—5209 |
| DE83704310 | INS-M—59 |
| DE83704311 | INS-R—295 |
| DE83704312 | INS-R—301 |
| DE83704313 | INS-R—302 |
| DE83704314 | INS-R—309 |
| DE83704316 | CEA-BIB—237 |
| DE83704317 | CEA-R—5211 |
| DE83704318 | CEA-CONF—6607 |
| DE83704319 | INS-R—298 |
| DE83704377 | IFT-P—06/81 |
| DE83704378 | INIS-BR—82 |
| DE83704379 | INIS-BR—83 |
| DE83704380 | INIS-BR—84 |
| DE83704381 | INIS-BR—79 |
| DE83704382 | INIS-mf—8263 |
| DE83704383 | INIS-mf—8272 |
| DE83704384 | INIS-mf—8260 |
| DE83704385 | INIS-mf—8271 |
| DE83704386 | INIS-BR—81 |
| DE83704387 | INIS-BR—85 |
| DE83704388 | INIS-mf—8257 |
| DE83704389 | INIS-mf—8265 |
| DE83704390 | FRNC-TH—1146 |
| DE83704391 | INIS-mf—8266 |
| DE83704392 | INIS-mf—8273 |
| DE83704393 | INIS-mf—8274 |
| DE83704394 | INIS-mf—8264 |
| DE83704395 | FRNC-TH—1148 |
| DE83704396 | INIS-mf—8269 |
| DE83704397 | FRNC-TH—1151 |
| DE83704398 | INIS-mf—8283 |
| DE83704399 | INIS-mf—8602 |
| DE83704400 | FRNC-TH—1115 |
| DE83704401 | INIS-mf—8262 |
| DE83704402 | INIS-mf—8270 |
| DE83704403 | INIS-mf—8268 |
| DE83704404 | FRNC-TH—1152 |
| DE83704405 | INIS-BR—80 |
| DE83704406 | INIS-mf—8627 |
| DE83704407 | INIS-mf—8605 |
| DE83704408 | INIS-mf—8606 |
| DE83704409 | INIS-mf—8611 |
| DE83704410 | INIS-mf—8613 |
| DE83704411 | INIS-mf—8623 |
| DE83704412 | INIS-mf—8626 |
| DE83704413 | INIS-mf—8617 |
| DE83704414 | INIS-mf—8628 |
| DE83704415 | INIS-mf—8604 |
| DE83704416 | INIS-mf—8607 |
| DE83704417 | INIS-mf—8608 |
| DE83704418 | INIS-mf—8610 |
| DE83704419 | INIS-mf—8612 |
| DE83704420 | INIS-mf—8614 |
| DE83704421 | INIS-mf—8621 |
| DE83704422 | INIS-mf—8624 |
| DE83704423 | INIS-mf—8625 |
| DE83704424 | INIS-mf—8609 |
| DE83704425 | INIS-mf—8616 |
| DE83704426 | INIS-mf—8620 |
| DE83704427 | INIS-mf—8615 |
| DE83704428 | INIS-mf—8618 |
| DE83704429 | INIS-mf—8629 |
| DE83751350 | DESY—83-034 |
| DE83751351 | GSF-S—885 |
| DE83751352 | DESY—83-037 |
| DE83751353 | DESY—83-039 |
| DE83751354 | DESY—83-032 |
| DE83751355 | DESY—83-005 |
| DE83751356 | Juel—1833 |
| DE83751357 | Juel—1821 |
| DE83751358 | Juel—1841 |
| DE83751359 | Juel—1835 |
| DE83751360 | Juel—1837 |
| DE83751361 | IABG-B-TF—1337 |
| DE83751362 | HMI-B—317 |
| DE83751414 | LRAP—16 |
| DE83751415 | LRAP—20 |
| DE83751416 | NE—1983-10 |
| DE83751417 | SNV-PM—1631 |
| DE83751418 | IVL-B—713 |
| DE83751419 | NE—1983-15 |
| DE83751421 | STUDSVIK—83-3 |
| DE83751422 | LUTMDN/TMVK—3118/1-32/(1983) |
| DE83751423 | NE—1983-14 |
| DE83751424 | NE/FBA—83-5 |
| DE83751425 | BFR-D—2-1983 |
| DE83751426 | IVA—236 |
| DE83751427 | KHM-TR—71 |
| DE83751428 | KHM-TR—78 |
| DE83751429 | KHM-TR—83 |
| DE83751430 | KHM-TR—85 |
| DE83751431 | KHM-TR—87 |
| DE83751444 | KTM/E-D—24 |
| DE83751445 | KTM/E-D—12 |
| DE83751446 | KTM/E-D—23 |
| DE83751447 | KTM/E-B—22 |
| DE83751448 | KTM/E-B—23 |
| DE83751449 | KTM/E-B—24 |
| DE83751450 | KTM/E-D—22 |
| DE83751459 | EFI-TR—2742 |
| DE83751460 | STF—15A81020 |
| DE83751461 | EFI-TR—2772 |
| DE83751462 | SI-R—780410-6 |
| DE83751463 | VERITAS-R—80-0045 |
| DE83751464 | VERITAS-R—81-0339 |
| DE83751465 | NP—3751465 |
| DE83751466 | FFI/Notat—80/4042 |
| DE83751467 | FFI/Notat—80/4014 |
| DE83751468 | FFI-TN-VM—64 |
| DE83751469 | FFI-TN-VM—352 |
| DE83751470 | FFI-TN-VM—350 |
| DE83751471 | FFI-TN-VM—325 |
| DE83751472 | FFI/Notat—80/4041 |
| DE83751473 | FFI-TN-VM—381 |
| DE83751474 | FFI-TN-VM—382 |
| DE83751475 | FFI-TN-VM—380 |
| DE83770411 | NP—3770411 |
| DE83770412 | NP—3770412 |
| DE83770413 | NP—3770413 |
| DE83770414 | NP—3770414 |
| DE83770415 | NP—3770415 |
| DE83770416 | NP—3770416 |
| DE83770417 | NP—3770417 |
| DE83770418 | NP—3770418 |
| DE83770419 | NP—3770419 |
| DE83770420 | CONF-811288— |
| DE83770421 | NP—3770421 |
| DE83770422 | NP—3770422 |
| DE83770423 | NP—3770423 |
| DE83770424 | NP—3770424 |
| DE83770425 | NP—3770425 |
| DE83770426 | NP—3770426 |
| DE83770427 | NP—3770427 |
| DE83770428 | NP—3770428 |
| DE83770429 | NP—3770429 |
| DE83770430 | NP—3770430 |
| DE84000004 | SERI/TR—252-1765 |
| DE84000005 | SERI/TR—253-1906 |
| DE84000007 | SERI/TR—231-2000 |
| DE84000013 | SERI/TP—215-2009 |
| DE84000016 | SERI/TP—255-2091 |
| DE84000043 | SAND—83-2080C |
| DE84000044 | SAND—83-0866C |
| DE84000110 | CONF-8110299—1 |
| DE84000167 | LBL—16523 |
| DE84000189 | ANL/RERTR/TM—3 |
| DE84000199 | CONF-8209191—1 |
| DE84000253 | DOE/JPL/956205—83/5 |
| DE84000306 | DOE/METC—83-45 |
| DE84000331 | DOE/PC/40797—T1 |
| DE84000349 | CONF-8305149—Summ. |
| DE84000358 | NYU/DAS—80-20 |
| DE84000512 | CONF-830807—14 |
| DE84000537 | KAPL—4156 |
| DE84000539 | DOE/PC/30013—4 |
| DE84000560 | EGG-M—27682 |
| DE84000561 | CONF-830702—23 |
| DE84000562 | EGG-M—07083 |
| DE84000564 | EGG-M—08683 |
| DE84000571 | DOE/NBM—4000571 |
| DE84000582 | DOE/ER/60055—T1 |
| DE84000587 | CONF-831235—2 |
| DE84000619 | BNL—33706 |
| DE84000623 | BNL-NUREG—33657 |
| DE84000647 | ORNL—5933 |
| DE84000662 | EGG-M—24682 |
| DE84000676 | PNL—4903 |
| DE84000681 | CONF-8309127—5 |
| DE84000710 | DOE/R4/10157—T1 |
| DE84000763 | DOE/R4/10154—T1 |
| DE84000817 | KAPL—4157 |
| DE84000818 | KAPL—4158 |
| DE84000837 | DOE/EV/04472—T3 |
| DE84000853 | DOE/ET/34006—9 |
| DE84000942 | SAND—83-2164C |
| DE84001012 | DOE/PC/50793—T4 |
| DE84001044 | LBL—16569 |

| Order No. | Report No. |
|---|---|
| DE84001055 | SAND—83-2148C |
| DE84001087 | DOE/EI/19624—T1 |
| DE84001098 | DOE/ET/15602—T6 |
| DE84001112 | DOE/PC/41265—T1 |
| DE84001129 | DOE/ER/40097—1 |
| DE84001134 | DOE/ET/53001—4 |
| DE84001150 | DOE/CE/30741—T1 |
| DE84001172 | LA-UR—83-2847 |
| DE84001208 | BNL—33685 |
| DE84001228 | DOE/BC/10316—26 |
| DE84001235 | UCRL—86248 |
| DE84001273 | DOE/ER/10581—T2 |
| DE84001301 | LA-UR—83-2776 |
| DE84001302 | LA-UR—83-2777 |
| DE84001313 | LA-UR—83-2761 |
| DE84001314 | LA-UR—83-2763 |
| DE84001320 | LA-UR—83-2681 |
| DE84001342 | PNL-SA—11136 |
| DE84001355 | LA-UR—83-2586 |
| DE84001364 | SAND—83-2137 |
| DE84001423 | UCRL—88961 |
| DE84001424 | UCRL—88672 |
| DE84001459 | BNL—33677 |
| DE84001464 | HEDL-SA—2987 |
| DE84001467 | HEDL-SA—2982 |
| DE84001468 | HEDL-SA—2984-FP |
| DE84001470 | HEDL-SA—2913 |
| DE84001476 | HEDL-SA—2860-FP |
| DE84001478 | HEDL-SA—2755-FP |
| DE84001481 | HEDL-SA—2829 |
| DE84001482 | HEDL-SA—2835-FP |
| DE84001483 | HEDL-SA—2858-FP |
| DE84001484 | HEDL-SA—2909-FP |
| DE84001486 | HEDL-SA—2874 |
| DE84001488 | HEDL-SA—2884a |
| DE84001492 | DOE/ET/29033—1 |
| DE84001493 | HEDL-SA—2839 |
| DE84001523 | MHD-III—83-070 |
| DE84001527 | CONF-831199—1-PT.1 |
| DE84001542 | DOE/ER/40048—22-N3 |
| DE84001543 | DOE/ER/40048—77-L3 |
| DE84001549 | DOE/ER/40048—73-L3 |
| DE84001556 | DOE/ET/53088—110 |
| DE84001559 | DOE/ET/53088—102 |
| DE84001560 | DOE/ET/53088—107 |
| DE84001590 | DOE/CS/15072—T5 |
| DE84001602 | DOE/NBB—0046 |
| DE84001610 | DOE/ET/20585—T1 |
| DE84001620 | DOE/EI/02295—1 |
| DE84001621 | DOE/ET/29034—1 |
| DE84001637 | DOE/ET/29035—1 |
| DE84001661 | LA-UR—83-2887 |
| DE84001663 | DOE/PC/50051—T3 |
| DE84001668 | DOE/ET/44614—T5 |
| DE84001669 | BNL—33772 |
| DE84001674 | BNL—33700-Summ. |
| DE84001682 | UCRL—15559-Vol.1 |
| DE84001704 | LA-UR—83-3014 |
| DE84001705 | LA-UR—83-3012 |
| DE84001706 | LA-UR—83-2979 |
| DE84001707 | LA-UR—83-2980 |
| DE84001708 | LA-UR—83-2982 |
| DE84001709 | LA-UR—83-2997 |
| DE84001721 | LA-UR—83-3095 |
| DE84001726 | LA-UR—83-3067 |
| DE84001727 | LA-UR—83-3072 |
| DE84001728 | LA-UR—83-3071 |
| DE84001739 | DOE/CS/20524—1-Draft |
| DE84001740 | DOE/CS/20524—2-Draft |
| DE84001742 | DOE/CS/20524—4-Draft |
| DE84001743 | DOE/CS/20524—5-Draft |
| DE84001747 | LA-UR—83-3110 |
| DE84001748 | LA-UR—83-3096 |
| DE84001759 | SAND—83-2252C |
| DE84001764 | DOE/PC/40781—T8 |
| DE84001768 | SAND—83-2298C |
| DE84001773 | BNL—33767 |
| DE84001781 | UCRL—89923 |
| DE84001782 | UCRL—89307 |
| DE84001790 | SAND—83-1401C |
| DE84001805 | DOE/CS/15061—T1 |
| DE84001855 | DOE/ET/27256—T38 |
| DE84001859 | DOE/PC/30238—T1 |
| DE84001867 | LA-UR—83-2896 |
| DE84001870 | LA-UR—83-2901 |
| DE84001881 | DOE/ER/40012—T1 |
| DE84001899 | DPST—83-736-Vol.2 |
| DE84001905 | RHO-PB-SR—10-B-CP-Sept.83 |
| DE84001906 | IS—4838 |
| DE84001908 | LA-UR—83-2927 |
| DE84001945 | CONF-820931—13 |
| DE84001948 | CONF-8210211—1 |
| DE84001950 | CONF-821054—2 |
| DE84001952 | DP-MS—83-14 |
| DE84001954 | CONF-8210204—1 |
| DE84001955 | CONF-8210100—6 |
| DE84001956 | CONF-8210203—1 |
| DE84001961 | CONF-8310206—1 |
| DE84001962 | CONF-830982—1 |
| DE84001983 | UCRL-Trans—11923 |
| DE84001984 | CONF-8310102—2 |
| DE84001992 | CONF-8210100—7 |
| DE84001997 | CONF-821048—3 |
| DE84002000 | CONF-821057—7 |
| DE84002020 | SLAC-PUB—3202 |
| DE84002025 | DOE/ET/15614—13 |
| DE84002026 | DOE/ET/15614—8 |
| DE84002027 | DOE/ET/15614—14 |
| DE84002028 | DOE/ET/15614—9 |
| DE84002029 | DOE/ET/15614—10 |
| DE84002030 | DOE/ET/15614—15 |
| DE84002031 | DOE/ET/15614—16 |
| DE84002034 | SLAC-PUB—3129 |
| DE84002037 | DOE/ET/15614—11 |
| DE84002038 | EGG-PBS—6379 |
| DE84002040 | SAND—83-2245C |
| DE84002041 | SAND—83-1890C |
| DE84002043 | SAND—83-1851C |
| DE84002045 | SAND—83-1852C |
| DE84002057 | DPST—71-590 |
| DE84002065 | CONF-821053—4 |
| DE84002066 | CONF-821053—5 |
| DE84002071 | DOE/CS/15066—T1 |
| DE84002082 | SLAC-PUB—3219 |
| DE84002097 | SERI/TR—8058-2-T5 |
| DE84002101 | SERI/TR—9002-2-T1 |
| DE84002107 | SAND—83-1418C |
| DE84002108 | UCID—19822-Rev.1 |
| DE84002110 | UCID—19926 |
| DE84002111 | UCID—19928 |
| DE84002112 | UCID—19923 |
| DE84002115 | HEDL-SA—2912-FP |
| DE84002117 | K/PS—5013-EA |
| DE84002123 | DOE/PC/30185—T2 |
| DE84002124 | DOE/ER/53150—T2 |
| DE84002126 | DOE/PC/30185—T1 |
| DE84002127 | DOE/CS/20173—T1 |
| DE84002135 | DOE/CS/20396—T1 |
| DE84002136 | ORO—838 |
| DE84002137 | SAND—83-7440 |
| DE84002143 | DOE/NASA/0250—1 |
| DE84002144 | DOE/CS/20271—2 |
| DE84002145 | UCID—19919 |
| DE84002146 | UCID—19917 |
| DE84002147 | SAND—83-0110 |
| DE84002149 | DOE/CE/15095—5 |
| DE84002151 | DOE/EIA—0413 |
| DE84002154 | DOE/PC/41755—T1 |
| DE84002165 | SAND—82-0998 |
| DE84002166 | DOE/NASA/17088—4 |
| DE84002167 | PNL—4800 |
| DE84002169 | MLM—3103 |
| DE84002171 | Y/DZ—77 |
| DE84002190 | PNL—4822 |
| DE84002194 | SAND—83-8024 |
| DE84002195 | UCID—19918 |
| DE84002197 | DOE/NASA/0254—1 |
| DE84002198 | UCRL-Trans—11919 |
| DE84002199 | UCRL-Trans—11918 |
| DE84002201 | EGG-M—11683 |
| DE84002218 | ANL—83-87 |
| DE84002219 | EGG-M—13283 |
| DE84002220 | EGG-M—12383 |
| DE84002221 | DOE/DP—0001/12 |
| DE84002226 | EGG-M—14483 |
| DE84002227 | EGG-M—11583 |
| DE84002235 | DOE/EI/08607—T1 |
| DE84002240 | NVO—263 |
| DE84002249 | ORNL/TM—8826 |
| DE84002251 | DOE/ET/10612—T1 |
| DE84002261 | ORNL/TM—8713 |
| DE84002266 | ORNL—5986 |
| DE84002268 | LA—9737-MS |
| DE84002269 | ORNL/TM—8837 |
| DE84002279 | DOE/ER/02887—T1 |
| DE84002286 | DOE/EP/16004—T1 |
| DE84002299 | LA—9848-MS |
| DE84002305 | ANL/CNSV-TM—120-Vol.2 |
| DE84002306 | SAND—83-1900 |
| DE84002308 | LA—9856-MS |
| DE84002310 | LA—9875-MS |
| DE84002311 | DOE/CS/20050—1 |
| DE84002320 | LA—9587-MS |
| DE84002321 | LA—9871-MS |
| DE84002322 | LA—9849-MS |
| DE84002326 | DOE/ET/34072—2 |
| DE84002328 | UCRL—15559-Vol.2 |
| DE84002333 | DOE/ET/34212—40 |
| DE84002335 | DOE/BP—189 |
| DE84002336 | DOE/EIA—0419 |
| DE84002339 | DOE/CR/10004—1 |
| DE84002340 | UCRL—15562 |
| DE84002341 | NUREG/CR—3417 |
| DE84002342 | DOE/ER/60076—1 |
| DE84002349 | SLAC—262 |
| DE84002350 | DOE/ET/34020—4 |
| DE84002355 | ORNL-tr—5043 |
| DE84002356 | DOE/ER/53140—10 |
| DE84002366 | DOE/ET/52017—T1 |
| DE84002368 | CONF-8111188—1 |
| DE84002371 | CONF-830104—6 |
| DE84002375 | SLAC-PUB—3136 |
| DE84002384 | SAND—83-2251C |
| DE84002393 | DOE/ET/20488—T1 |
| DE84002401 | DOE/PC/30209—T5 |
| DE84002402 | LA—9748-MS |
| DE84002404 | LA—9651-MS |
| DE84002417 | GA-A—17109 |
| DE84002429 | DP-MS—83-107 |
| DE84002430 | K/PS—5027 |
| DE84002436 | DOE/ER/10612—9 |
| DE84002438 | DOE/ER/10597—2 |
| DE84002450 | DOE/ET/10143—19-Rev. |
| DE84002453 | UCRL—88921 |
| DE84002455 | UCRL—89214 |
| DE84002459 | UCRL—89894 |
| DE84002463 | UCRL—89298 |
| DE84002464 | NUREG/CR—3467 |
| DE84002466 | UCID—19075-Vol.2 |
| DE84002467 | UCRL—89632 |
| DE84002468 | UCRL—89753 |
| DE84002469 | UCRL—89797 |
| DE84002474 | UCID—19903 |
| DE84002475 | RFP—3511 |
| DE84002479 | KAPL—4154 |
| DE84002500 | ORNL/TM—8414 |
| DE84002521 | EGG-FT—6392 |
| DE84002537 | SAND—83-2234C |
| DE84002538 | SAND—83-1881C |
| DE84002539 | SAND—83-0930C |
| DE84002540 | SAND—83-1829C |
| DE84002548 | PNL-SA—9942-Rev. |
| DE84002560 | GA-A—16807 |
| DE84002581 | PNL-SA—11539 |
| DE84002583 | DOE/ER/05224—7 |
| DE84002587 | PNL-SA—11441 |
| DE84002588 | DOE/ET/10143—42 |
| DE84002594 | PNL-SA—11541 |
| DE84002595 | PNL-SA—11447 |
| DE84002596 | PNL-SA—11536 |
| DE84002603 | DOE/ER/01713—T2 |
| DE84002604 | DOE/PC/40783—T12 |
| DE84002606 | DOE/ET/27184—T1 |
| DE84002607 | BMI/OCRD—4(5) |
| DE84002608 | DOE/CS/24315—20 |
| DE84002611 | SAND—83-2276C |
| DE84002615 | DOE/CS/20230—1 |
| DE84002616 | DOE/SF/01326—T5 |
| DE84002617 | DOE/SF/01326—T6 |
| DE84002621 | UCRL-Trans—11922 |
| DE84002622 | UCRL-Trans—11921 |
| DE84002623 | UCRL-Trans—11920 |
| DE84002627 | PNL—4581-App.A-B |
| DE84002628 | DOE/ER/10618—10 |

| Order No. | Report No. |
|---|---|
| DE84002630 | IS—4820-Vol.1-2 |
| DE84002634 | IS—4815 |
| DE84002638 | DOE/ET/53045—7 |
| DE84002639 | DOE/ER/10815—2 |
| DE84002642 | DOE/PC/50057—T4 |
| DE84002643 | DOE/ER/10599—21 |
| DE84002648 | DOE/ER/02853—20 |
| DE84002649 | DOE/EV/00900—6 |
| DE84002653 | DOE/ER/10371—5 |
| DE84002662 | DP-MS—83-31-Rev.1 |
| DE84002664 | DP-MS—83-109 |
| DE84002667 | WIPP-DOE—171 |
| DE84002669 | GA-A—16982 |
| DE84002677 | SLAC-PUB—3249 |
| DE84002691 | DOE/RG/10174—T1 |
| DE84002694 | BNL—33840 |
| DE84002696 | BNL—33859 |
| DE84002698 | ANL-Trans—1215 |
| DE84002699 | ANL-Trans—1212 |
| DE84002701 | DOE/ET/13148—2 |
| DE84002713 | UCRL—86246 |
| DE84002714 | UCRL—89397 |
| DE84002722 | UCRL—89327 |
| DE84002723 | UCRL—89964 |
| DE84002727 | UCRL—89844 |
| DE84002731 | SAND—83-2013C |
| DE84002732 | DOE/PC/50811—T2 |
| DE84002734 | DOE/PC/30249—T6 |
| DE84002738 | CONF-831111—10 |
| DE84002742 | NRL-MR—5161 |
| DE84002743 | NRL-MR—5186 |
| DE84002744 | DOE/CE/15095—4 |
| DE84002751 | DOE/EA—0221 |
| DE84002752 | DOE/EP—0058/1 |
| DE84002758 | SAND—83-2074 |
| DE84002759 | SLAC-PUB—3235 |
| DE84002760 | SLAC-PUB—3236 |
| DE84002761 | SLAC-PUB—3237 |
| DE84002764 | DOE/PC/60796—1 |
| DE84002765 | DOE/ID—10115 |
| DE84002766 | EGG-M—03283 |
| DE84002768 | DOE/ER/45025—2 |
| DE84002773 | UCRL—87469 |
| DE84002774 | UCRL—15549 |
| DE84002775 | UCRL—15496 |
| DE84002779 | UCRL—88913 |
| DE84002780 | UCRL—89570 |
| DE84002784 | UCRL—15561 |
| DE84002785 | UCRL—89969 |
| DE84002786 | UCRL—15564 |
| DE84002789 | UCRL—15560 |
| DE84002790 | UCRL—88669 |
| DE84002792 | UCRL—88041 |
| DE84002794 | UCRL—88690 |
| DE84002802 | SAND—83-1409C |
| DE84002803 | DOE/NV/00410—80 |
| DE84002805 | CONF-8309125—2 |
| DE84002809 | DOE/ET/51013—100 |
| DE84002810 | DOE/SF/01264—T1 |
| DE84002811 | RFP-Trans—414 |
| DE84002812 | RFP-Trans—416 |
| DE84002813 | DOE-tr—258 |
| DE84002814 | DOE-tr—4002814 |
| DE84002816 | LA-tr—83-21 |
| DE84002817 | NVO—268 |
| DE84002818 | NVO—269 |
| DE84002819 | DPST—83-780 |
| DE84002824 | NVO—266 |
| DE84002825 | NVO—267 |

| Order No. | Report No. |
|---|---|
| DE84002831 | MLM—3112(OP) |
| DE84002842 | DOE/ER/03992—526 |
| DE84002843 | DOE/ER/03992—0527 |
| DE84002844 | DOE/ER/03992—530 |
| DE84002845 | DOE/ER/03992—529 |
| DE84002848 | DOE/ER/03992—531 |
| DE84002888 | LBL—11531 |
| DE84002891 | SAND—83-7120 |
| DE84002903 | DOE/CS/50007—T2 |
| DE84002954 | DOE/CE—0108 |
| DE84002957 | HEDL-TME—83-28 |
| DE84002960 | GEPP-TIS—761 |
| DE84002964 | DOE/ER/10956—6 |
| DE84002971 | SAND—83-7020 |
| DE84002973 | ORNL/TM—8874 |
| DE84002975 | ORNL/TM—8697 |
| DE84002976 | ORNL/TM—8871 |
| DE84002977 | ORNL/TM—8840 |
| DE84002979 | ORNL—5957 |
| DE84002988 | ORNL/Sub—80-7800/2 |
| DE84002989 | ORNL/CON—118 |
| DE84002991 | ORNL/CON—142 |
| DE84002997 | ORNL/CSD—126 |
| DE84002998 | ORNL/TM—8819 |
| DE84003003 | UCRL—88495-REV.1 |
| DE84003009 | DOE/ER/10755—3 |
| DE84003011 | DOE/ER/02313—13 |
| DE84003015 | DOE/ER/10956—5 |
| DE84003018 | DOE/ER/10811—83 |
| DE84003021 | UCRL—89993 |
| DE84003022 | DOE/ET/37249—1 |
| DE84003040 | LBL—16259 |
| DE84003041 | UCRL-Trans—11916 |
| DE84003046 | LBL—16694 |
| DE84003154 | SAND—83-1214 |
| DE84003341 | PNL—4179 |
| DE84700001 | CEA-CONF—6634 |
| DE84700002 | FEI—1308 |
| DE84700003 | IAE—3611/12 |
| DE84700004 | IPNO-TH—83-01 |
| DE84700005 | ITEF—166(1982) |
| DE84700006 | WIS-PH—82/42 |
| DE84700007 | WIS-PH—83/19 |
| DE84700008 | WIS-PH—83/23 |
| DE84700009 | WIS-PH—83/24 |
| DE84700010 | JAERI-M—82-118 |
| DE84700011 | JAERI-M—82-146 |
| DE84700012 | WIS-PH—83/16 |
| DE84700013 | CEA-N—2338 |
| DE84700014 | EUR-CEA-FC—1170 |
| DE84700015 | EUR-CEA-FC—1171 |
| DE84700016 | EUR-CEA-FC—1173 |
| DE84700017 | IA—1378 |
| DE84700018 | IAE—3545/7 |
| DE84700019 | IAE—3600/6 |
| DE84700020 | ILE—8202P |
| DE84700021 | IPPJ—552 |
| DE84700022 | IPPJ—553 |
| DE84700023 | IPPJ—554 |
| DE84700024 | IPPJ—555 |
| DE84700025 | IPPJ—556 |
| DE84700026 | IPPJ—557 |
| DE84700027 | IPPJ—558 |
| DE84700028 | IPPJ—559 |
| DE84700029 | IPPJ—567 |
| DE84700030 | IPPJ—575 |
| DE84700031 | IPPJ—576 |
| DE84700032 | IPPJ—580 |
| DE84700033 | IPPJ—583 |

| Order No. | Report No. |
|---|---|
| DE84700034 | KAERI/RR—381/82 |
| DE84700035 | KFTI—82-48 |
| DE84700036 | NIIEFA-P-B—0558 |
| DE84700037 | NIIEFA-P-K—0570 |
| DE84700038 | NIIEFA-P-OM—0542 |
| DE84700039 | CEA-N—2329 |
| DE84700040 | IPNO-TH—83-02 |
| DE84700041 | ITEP—96(1982) |
| DE84700042 | JINR—R-2-82-562 |
| DE84700043 | JINR—R-2-82-563 |
| DE84700044 | JINR—R-2-82-832 |
| DE84700045 | JINR—R-4-82-564 |
| DE84700046 | WIS-PH—82/55 |
| DE84700047 | WIS-PH—82/58 |
| DE84700048 | WIS-PH—82/60 |
| DE84700049 | WIS-PH—83/26 |
| DE84700050 | WIS-PH—83/3 |
| DE84700051 | WIS-PH—83/4 |
| DE84700052 | WIS-PH—83/9 |
| DE84700053 | CEA-N—2324 |
| DE84700054 | IFVE-OEIPK—82-153 |
| DE84700055 | ITEF—103(1982) |
| DE84700056 | JINR—D-1-82-895 |
| DE84700057 | JINR—E-1-82-847 |
| DE84700058 | JINR—R-1-82-334 |
| DE84700059 | JINR—R-1-82-559 |
| DE84700060 | JINR—R-1-82-887 |
| DE84700061 | FEI—1282 |
| DE84700062 | JAERI-M—82-130 |
| DE84700064 | CEA-CONF—6648 |
| DE84700065 | IPNO-TH—83-04 |
| DE84700066 | JINR—E-2-82-409 |
| DE84700067 | JINR—E-4-82-512 |
| DE84700068 | JINR—R-4-82-531 |
| DE84700069 | WIS-PH—83/21 |
| DE84700070 | ZfK—498 |
| DE84700071 | CEA-CONF—6649 |
| DE84700072 | CEA-CONF—6651 |
| DE84700073 | CEA-CONF—6674 |
| DE84700074 | CEA-CONF—6675 |
| DE84700075 | CEA-N—1466-Pt.8 |
| DE84700076 | IPNO-DRE—83-02 |
| DE84700077 | IPNO-DRE—83-07 |
| DE84700078 | JAERI-M—82-128 |
| DE84750124 | CEA-CONF—6659 |
| DE84750177 | CRN-CPR—83-02 |
| DE84750244 | IKE—8-1 |
| DE84780010 | IAEA-SR—72 |
| DE84900011 | NEANDC—J-91/U |
| DE84900033 | NP—4900033 |
| DE84900047 | NUREG—1020-Vol.2-App. |
| DE84900048 | NUREG—1020-Vol.1 |
| DE84900074 | TVA/OACD—83/15 |
| DE84900076 | TVA/PUB—84/3 |
| DE84900134 | NP—4900134 |
| DE84900201 | TRI-PP—83-64 |
| DE84900240 | NP—4900240 |
| DE84900253 | NP—4900253 |
| DE84900263 | NUREG/CR—3370 |
| DE84900264 | USGS-PP—1252 |
| DE84900272 | NUREG/BR—0051-Vol.5-No.1 |
| DE84900281 | NUREG—0750-Vol.17-No.2 |
| DE84900284 | NUREG—0750-Vol.17-No.1 |
| DE84900355 | TVA/PUB—84/6 |

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DK Denmark
DO Dominican Republic
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EA European American Committee Reactor Physics
EC Ecuador
ED European American Nuclear Data Committee
EG Egypt
ER European Space Research Organization
ES Spain
ET Ethiopia
EU European Company for the Chemical Processing of Irradiated Fuels

FI Finland
FJ Fiji
FR France

GA Gabon
GB United Kingdom of Great Britain and Northern Ireland (UK)
GD Grenada
GH Ghana
GM Gambia
GN Guinea
GQ Equatorial Guinea
GR Greece
GT Guatemala
GW Guinea-Bissau
GY Guyana

HK Hong Kong
HN Honduras
HT Haiti
HU Hungary
HV Upper Volta

IA Inter-American Nuclear Energy Commission
IB International Bank for Reconstruction and Development
ID Indonesia
IE Ireland
IG Inter-Governmental Maritime Consultative Organization
II International Commission on Radiation Units and Measurements
IL Israel

IN India
IO International Labor Organization
IP International Union of Pure and Applied Physics
IQ Iraq
IR Iran
IS Iceland
IT Italy
IX International Union of Pure and Applied Chemistry

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JO Jordan
JP Japan

KE Kenya
KH Cambodia
KP Democratic People's Republic of Korea
KR Korea, Republic of
KW Kuwait

LA Laos
LB Lebanon
LI Liechtenstein
LK Sri Lanka
LR Liberia
LS Lesotho
LU Luxembourg
LY Libyan Arab Republic

MA Morocco
MC Monaco
MG Madagascar
ML Mali
MN Mongolia
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MU Mauritius
MV Maldives
MW Malawi
MX Mexico
MY Malaysia

NE Niger
NG Nigeria
NI Nicaragua
NL Netherlands
NO Norway
NP Nepal
NR Nauru
NZ New Zealand

OE Organization for Economic Cooperation and Development
OM Oman

PA Panama
PE Peru
PG Papua New Guinea
PH Philippines
PK Pakistan
PL Poland
PR Puerto Rico
PT Portugal
PY Paraguay

QA Qatar

RH Southern Rhodesia
RO Romania
RW Rwanda

SA Saudi Arabia
SD Sudan
SE Sweden
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SK Sikkim
SL Sierra Leone
SM San Marino
SN Senegal
SO Somalia
SU Union of Soviet Socialist Republics (USSR)
SV El Salvador
SY Syria
SZ Swaziland

TC Trucial Oman
TD Chad
TG Togo
TH Thailand
TN Tunisia
TO Tonga
TR Turkey
TT Trinidad and Tobago
TW Taiwan
TZ United Republic of Tanzania

UA Ukrainian Soviet Socialist Republic (Ukrainian SSR)
UE United Nations Educational, Scientific and Cultural Organization
UF United Nations Children's Fund
UG Uganda
UI United Nations Industrial Development Organization
US United States of America (USA)
UY Uruguay

VA Holy See
VD Democratic Republic of Viet-Nam
VE Venezuela
VS Republic of Viet-Nam

WM World Meteorological Organization
WS Western Samoa

XA International Atomic Energy Agency (IAEA)
XC European Organization for Nuclear Research (CERN)
XE Commission of the European Communities (CEC)
XF Food and Agriculture Organization of the United Nations (FAO)
XJ Joint Institute for Nuclear Research (JINR)
XM Council for Mutual Economic Assistance (CMEA)
XN Nuclear Energy Agency of the OECD (NEA)
XO Organization of African Unity (OAU)
XR International Commission on Radiological Protection (ICRP)
XS International Organization for Standardization (ISO)
XU United Nations (UN)
XW World Health Organization (WHO)
XX World Energy Conference (WEC)

YD Democratic Yemen
YE Yemen
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire

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